the OIL AND GAS JOURNAL

PUBLISHED WEEKLY JUNE 19, 1961

Let glycols help inhibit hydrate formation p. 92

Industry faces a talent shortage ▸ 59

What Socal's merger means to small refiners ▸ 64

Kerr-McGee plans biggest drilling platform ▸ 77

How a gas-storage project developed ▸ 86

Hugoton wells get cathodic protection ▸ 98

Where oil is headed in

VENEZUELA

as seen by the Venezuelan Government

p. 81

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OIL AND GAS JOURNAL
Vol. 59, No. 25

Contents June 19, 1961

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TECHNOLOGY—OPERATION

Drilling-Production

How the Mount Simon Gas-Storage Project Was Developed 86
By Walter M. Rzepczynski, Donald L. Katz, M. Rasin Tek, and Keith H. Coats

Continued need for gas-storage capacity in the Chicago area led to the development of the Mount Simon gas-storage reservoir, Herscher field, Illinois. Here's how the reservoir was put into operation, from first investigation to full-scale use.

Cosden "Foams" Liquids from Gas-Drilled Hole 96
By Ed McGhee

This is an inexpensive solution to an old problem encountered in air and gas drilling when large quantities of salt water and oil are found.

Hugoton Wells Get Cathodic Protection 98
By Merle Blakely

This is being done by Skelly Oil Co. on a mass scale in Hugoton and Panhandle fields to curb external casing corrosion. About 200 wells are involved in an area nearly 200 miles long.

Suggested Solution for the Crooked-Hole Problem 103
By S. R. Knapp

A new downhole assembly, featuring two flexible pipe sections above two top full-gage stabilizers, is suggested by the author to straighten out the hole when bit tries to deviate.

Oil-Well Pumping—44 121
By Joseph Zaba

Multiple rod pumping.

Pipelining

Trunkline Installs Gas-Turbine Compressor 108

Coral is Problem in Oahu Terminal 127

Both crude-oil and bunkering lines to California Standard's offshore mooring have heating lines pretensioned to prevent expansion and possible buckling.

Refining-Processing

Let Glycols Help Inhibit Hydrate Formation. 92
By J. L. Arnold and R. L. Pearce

Here's how to select the right glycol, injection rate, and concentration to give good inhibition in low-temperature units. Also included are pointers to prevent or correct common operating troubles.

Questions on Technology 109

How to compute refinery complexity.

The Foreman's Page 111

Beginning a review of heat transfer, chemistry, and combustion principles.

New Data on Isocracking 112
By J. A. Robbers, N. J. Patterson, and W. T. Lane

These two findings are among the more significant: (1) bid prices from contractors show that costs will be about one-third less than those estimated a year ago, and (2) end-point limits on feed stocks have been raised.

Processing Notes 116

Refrigerated-LPG plant under construction in Ras Tanura—Radiotracers remove feed contaminants—Tankers, barges loaded by gravity—Esso develops improved butyl rubber.

THE OIL AND GAS JOURNAL **Newsletter**

June 19, 1961

The oil industry may be facing a **serious shortage** of engineering talent.

This year, recruiters did all right—but they didn't get enough quality students.

What's worse: Enrollment in all engineering sciences is down. Oil's going to feel a pinch—and maybe sooner than it thinks (p. 59).

▼ ▼ ▼

Proposed fuels study **must be kept free** of any drift toward end-use control.

That sums up views of spokesmen for oil, gas, and coal who testified in Senate Interior Committee hearing on study (p. 62).

Texas Gov. Price Daniel also spoke out. He sent hearing a statement to the effect that any policy which tries to allocate markets—or to impose end-use control—would **seriously damage** oil-and-gas conservation programs.

▼ ▼ ▼

New Harris bill to regulate gas producers is something of **a trial balloon** at this point.

Rep. Oren Harris, in a Journal interview last week (p. 67), said he's been assured no support so far from any branch of industry, from FPC, or from White House. If no enthusiasm for bill develops, he says, no hearings will be held.

Gas-well completions in the U. S. are **running well ahead** of last year.

At mid-June, the 1961 total of completions stood at 1,933—29% above 1,500 total for same period of 1960.

Included in this year's figure: 177 gas discovery wells, up from 136 last June.

Conch Methane has given some clues about its big ships which will carry liquefied natural gas from Africa to England.

Two Conch engineers told the World Tanker conference the company is thinking of ships that will carry 167,000 bbl. of product. They'll be **fast, unusually deep ships** carrying nine prismatical tanks in three insulated holds.

Tanks for the frigid product will be of aluminum alloys, although company is now investigating 9% nickel steel and other materials for later ships.

Versatile gas turbine continues to make news:

San Francisco fire department is testing gas-turbine-driven fire truck. It's second of the kind—first belongs to Seattle fire department. Power for San Francisco truck is supplied by Boeing 502 gas turbine weighing 325 lb. Engine **can produce 330 hp.** at full throttle.

Northern Illinois Gas intends to use **gas-turbine systems** for all power needs in two new buildings, its West Central headquarters and General Office. **Aim:** Economy.

▼ ▼ ▼

Work on **biggest mobile drilling rig** ever designed will start this month.

Contract has been let for Kerr-McGee Oil Industries' Rig 54, which will be able to operate in 175 ft. of water. Limit of available equipment is 150-ft. depth.

At $7 million, new rig also will be world's costliest.

Kermac's triangular giant is being built at Avondale Marine Ways shipyard near New Orleans. Completion is set for April 1962 (p. 77).

Important deep wildcat will be drilled by Humble in New Mexico's San Juan basin.

The 12,500-ft. test in northern portion of San Juan County will go to Mississippian for sure—maybe to basement.

There has been no deep drilling in neighborhood of the well, North Kirland unit 2.

Site is 26 miles northeast of Continental Oil's recent Table Mesa Pennsylvanian discovery. Conoco well had high helium content and attracted attention to San Juan's deeper formations.

Found: **A money-saving** way to foam salt water and oil out of gas-drilled holes.

Success of Cosden Refining and Grappe Drilling at Cosden's Miller 1 near Ozona, in West Texas, may have important implications for rest of industry (p. 96).

Key to operation was use of new foamer, Atlas Powder's Afrox 200.

Hole unloaded in 21 minutes after slug of water-foamer mixture was pumped down drill pipe. Earlier, hole had been gas drilled 262 ft. with practically no returns.

▼ ▼ ▼

Canadian crude exports to U. S. won't be allowed to **get out of hand.**

Exporters and their customers across the border who have been worried about a possible crackdown on their rising trade can relax. So can producers who have feared excessive displacement of domestic crude in northern U. S. refining centers.

Both the **Canadian industry and government** are determined not to let exports go so far out of control that U. S. would be forced to put Canada under import restrictions.

Safe bet: Alberta Conservation Board will **take some action soon** on numerous competing applications for gathering systems to handle natural-gas liquids.

Decision has to come quickly or there'll be complications. Further delay would mean projects couldn't be finished in time to take liquids from plants going on stream this fall.

▼ ▼ ▼

Alaska's rules on noncompetitive leases are **drawing opposition.**

Some operators dislike practice of letting a company drop its name in the hat for only a $20 filing fee.

They contend first-year rental should be required. Object: To keep promoters from getting leases and then trying to peddle them or trying to raise money to pay rental.

Acreage in Tyonek area will be leased July 27 with no rental required in some cases until 30 days after leases are granted.

Hearing will be held later to discuss rule changes.

Strings on exploration-development of Canada's Arctic archipelago have been loosened.

But operators are still hesitant. They aren't sure the incentives in reduced royalties and larger production concessions **match the risks** of the Far North.

Upshot: No great exploration rush is expected.

▼ ▼ ▼

Venezuela's oil minister has been peering into the future.

What Dr. Juan Pablo Perez Alfonzo sees there offers **little encouragement** for additional private investment in his nation's oil industry.

He does say there's no move afoot to nationalize oil, and no further taxation is in sight. But he stresses that no new concessions will be granted. Nor will the national oil company be allowed to hook up with a private firm in any mixed-capital enterprise.

If the oil industry wants **to step up activity,** he says, it can explore the territory it has now. And if it wants to improve profits, it can raise the price of oil.

Other highlights of interview with Perez Alfonzo are on p. 81.

Don't be surprised if Japanese come up with another foreign exploration deal—this time in North Borneo.

Teikoku Oil, local Japanese crude producer, has been notified that North Borneo Government is **ready to start talks** on concession bid by company.

▼ ▼ ▼

Look for more hikes in motor-vehicle registration fees.

Boosts have been proposed or enacted in 13 states so far this year. And bills to put other special fees on vehicles have been unveiled in several legislatures.

Revenue-spurring measures were passed in North Dakota, Indiana, Washington, Illinois.

Hanging fire are similar proposals for Connecticut, Delaware, New Hampshire, Florida, North Carolina, Ohio, Oklahoma, Alabama, and California.

Highway Trust Fund continues to take in more than it spends.

Fund went into last 2 months of 1961 fiscal year with surplus of more than $244 million. In April, National Highway Users Conference says, expenditures were $61 million behind receipts.

April intake from tax sources totaled $201 million. Spending reached $140 million.

On the rise: Lubricant production in U. S. and Canada.

Latest report by National Lubricating Grease Institute shows U. S. gross production topped 1 billion pounds last year. Canadian output hit 76 million pounds.

Totals for both countries were highest in 4-year history of NLGI surveys. Gains were scored despite drop in use of lubricants by industries like steel.

Market memo

June 19, 1961

Independent refiners have lost much of their excitement over the Socal-Kentucky merger plan.

The Justice Department announcement that independents must get 40% of the five-state Kentucky market (OGJ, June 12, p. 81) kicked up a lot of enthusiasm, especially on the Gulf Coast.

But last week it seemed obvious that it will be at least a year and a half before independents get any big share of this 93,000-bbl. daily market.

After the merger becomes effective and after notice is served to cancel earlier contracts, Jersey still will supply 80% of the market for a year and 60% the second year.

Independents also were promised 40% of Socal's requirements in six other states. What this amounts to is a question mark. Socal isn't talking about its market plans until after its stockholders vote on the Kentucky merger.

Products currently are characterized by quietness on the gasoline spot market and scattered local price adjustments. Some interesting movements of No. 2 and No. 6 are worth noting, however.

East Coast developments center around local weaknesses in motor gasoline.

Fair trading appears headed for the ash can in Pennsylvania. American touched it off with a 2-cent cut in Western Pennsylvania and a statement it was ending fair trading. Most other major marketers soon followed with dealer tankwagon cuts ranging from 1.5 to 2 cents.

Much publicized Charlotte market again has deteriorated. Esso cut dealer tankwagon price 2 cents. Some prices are down as low as 8.5 cents—only 2 cents above the mid-May low mark of the price war. Other cuts: Mobil 0.9 cent to dealers in upper New York state and Humble 3 cents in the New Orleans area.

Both Gulf Coast and Mid-Continent gasoline markets reflect little buying interest.

Talk on the Gulf is that firm buying orders would probably get a half cent off the 10.75-cent posting for 92-octane. The Mid-Continent appears firm at 12.25 cents for regular spots with some suppliers trying to reestablish the 2.75-cent differential for premium.

Chicago and St. Louis prices are firming under influence of American Oil's 1-cent advance in Illinois and eastern Missouri. This improvement also has had a firmer influence on Mississippi River markets.

The No. 2 market on the Gulf got a shot in the arm with sale of three cargoes by independents to a major for June lifting. This added a boost to the 8.25-cent posting there. Increased volume of distillates also is moving on the East Coast at discounts.

Tight No. 6 market on the Gulf was confirmed during the week when an eastern buyer went to the West Coast to pick up three cargoes. Sale of 150,000 gal. of No. 6 in the Mid-Continent for immediate shipment from Kansas to Nebraska also was reported.

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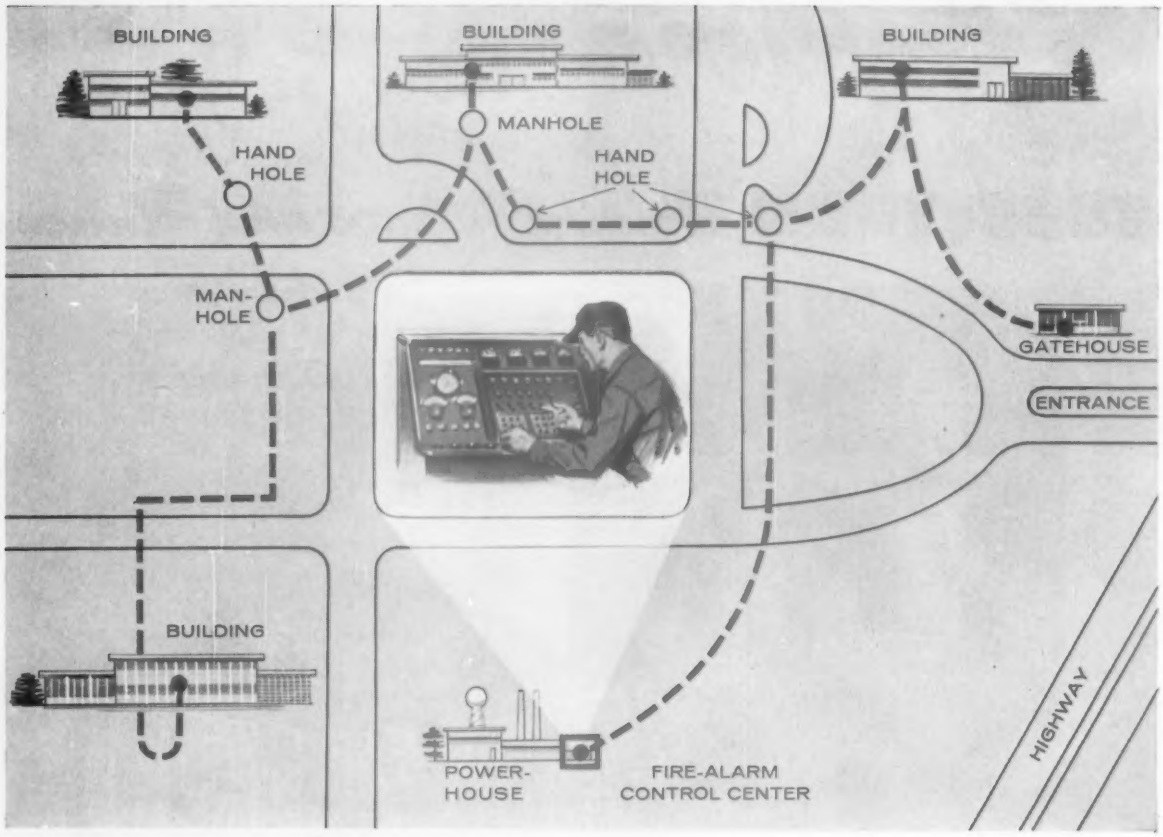

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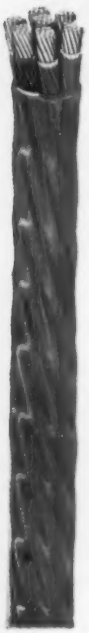

The control cables of a fire-alarm system linking several buildings of a manufacturing plant (shown above) are now made with primary insulation and jacketing of Du Pont TEFLON 100 FEP resin. *There are good reasons why.* The jacketing previously used had been attacked by heat and moisture from a steam line adjacent to one of the underground conduits. By-products of the deteriorated jacketing attacked shielding and primary insulation. The cable shorted out . . . the alarm system became inoperative . . . a costly and time-consuming repair problem arose.

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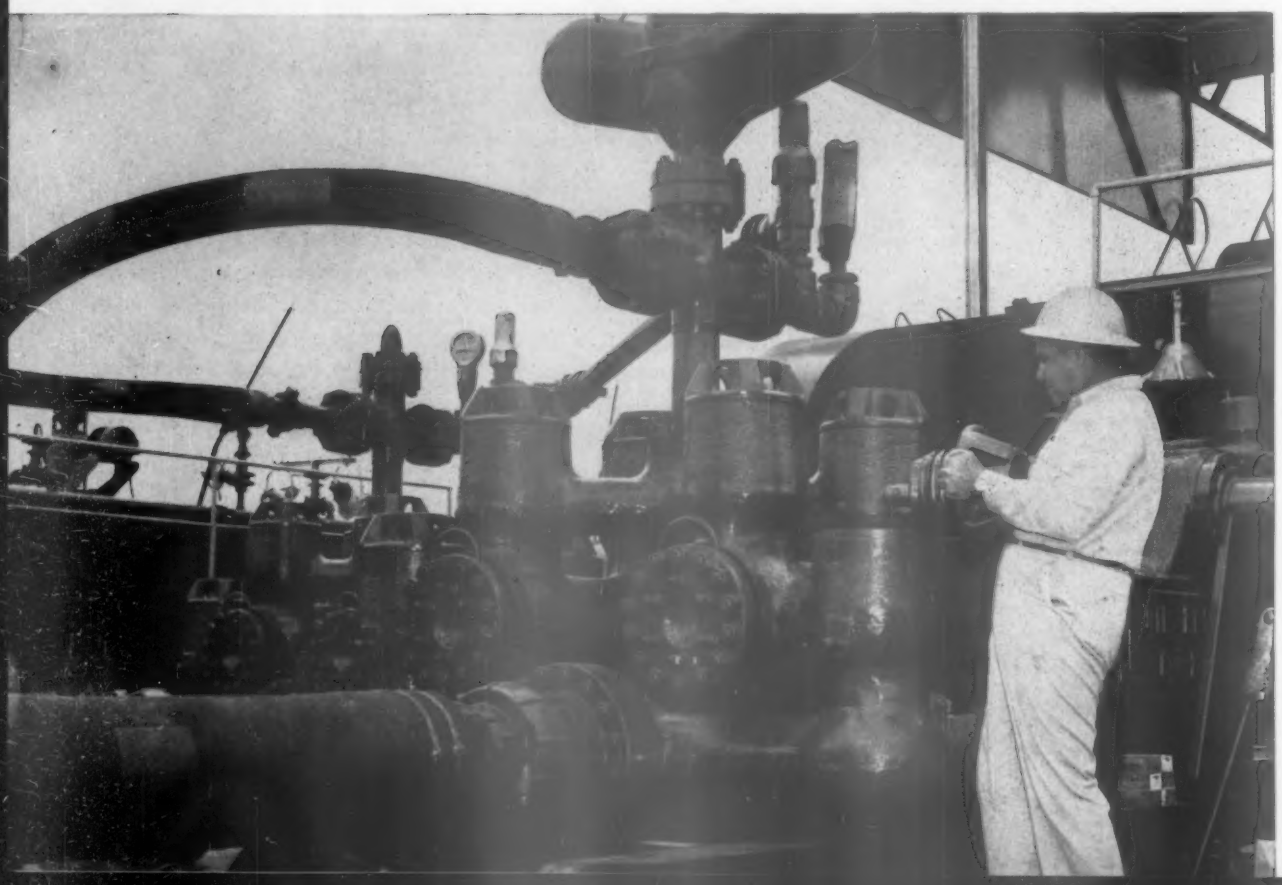

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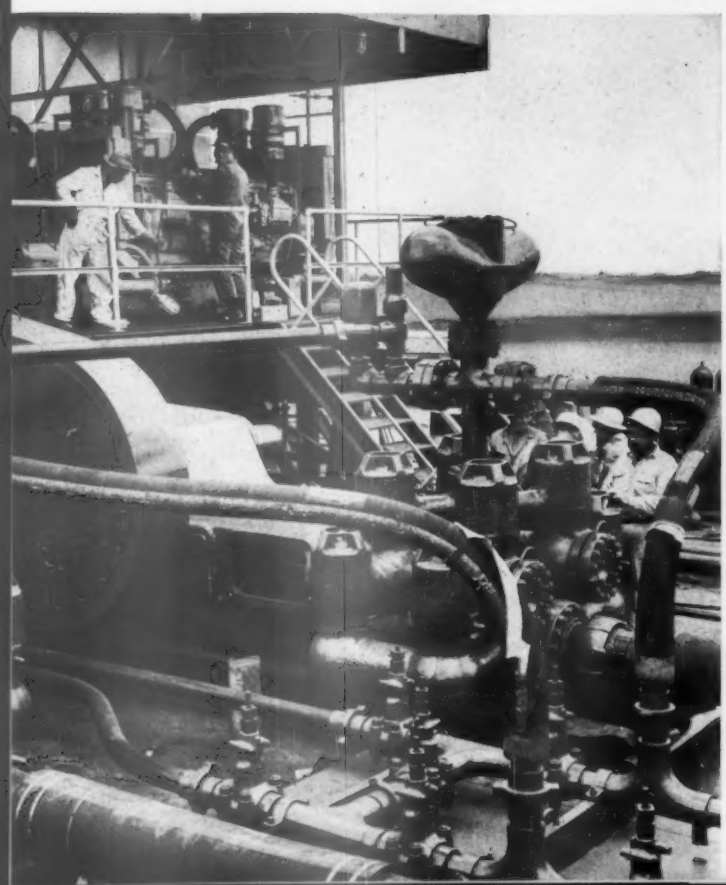

If you're rigging up, don't forget friction tape

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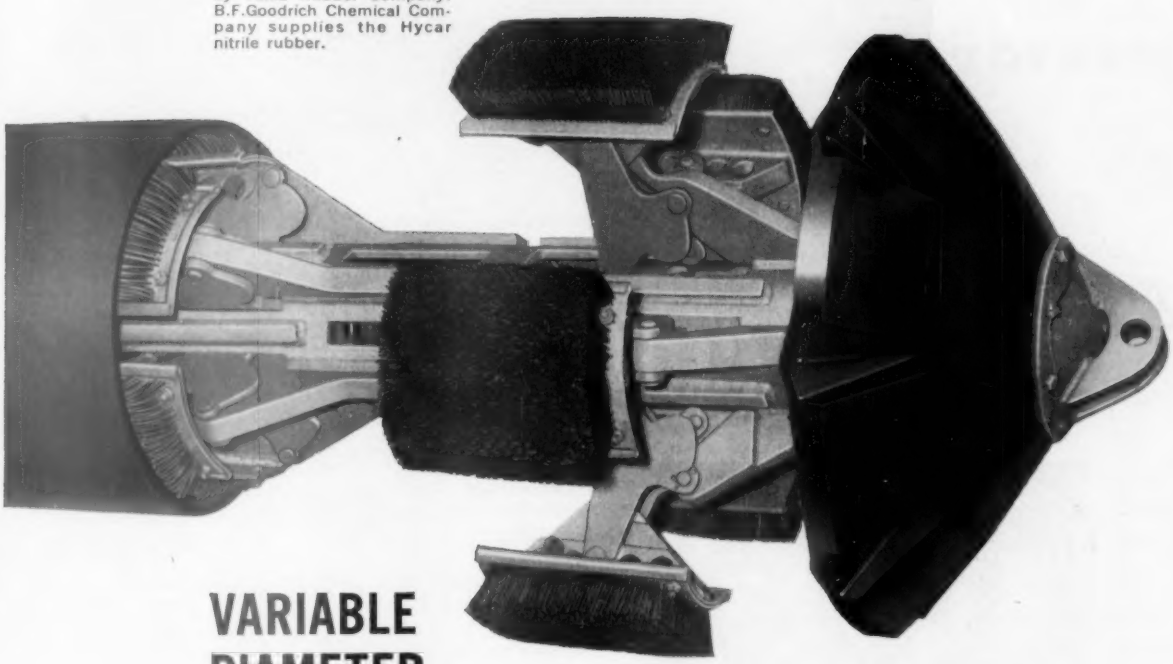
Service Pipe Line Company, Tulsa, designed this variable diameter pig, in different sizes for use from 3" to 26" pipe, using propellant cups molded by Tulsa Rubber Company. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.



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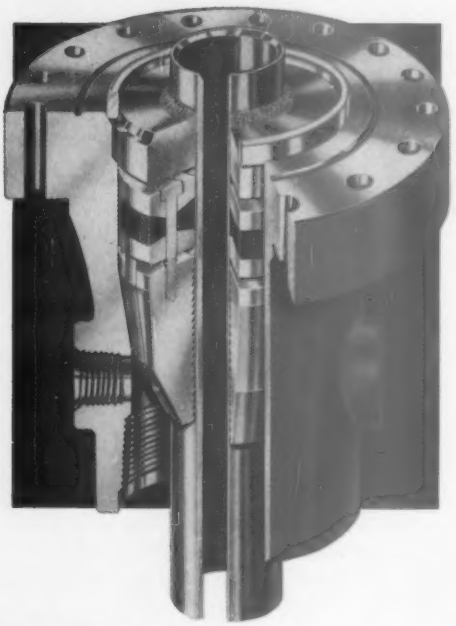

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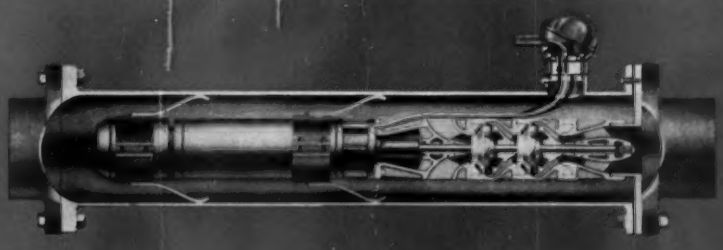
Layne In-Line pumps are made as small as 4 inch bowls on a 4 inch motor for use in a 6 inch pipe to deliver 30 GPM. Larger sizes are available as required. For additional information write for free bulletin number 203.



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FROM UNION CARBIDE CHEMICALS COMPANY

Ethylene Glycol Scores High As Hydrate Inhibitor

In refrigeration-type gasoline recovery plants, the most widely used hydrate point depressant is diethylene glycol. But, ethylene glycol may offer certain advantages as a replacement in your plant, for example . . .

SELECTION GUIDE

ADVANTAGE	Ethylene Glycol	Diethylene Glycol
Hydrate Inhibition	GOOD	GOOD
Ease of Separation	BETTER	GOOD
Cost	LOWER	—
Vaporization Loss	LOW	LOWER
Solubility Loss	LOWER	LOW

HYDRATE INHIBITION

While both ethylene and diethylene glycol give good hydrate inhibition, with hydrate point depressions generally in the range of 60° to 80°F., reports indicate that ethylene glycol may give a greater depression in those cases needing very low separation temperatures.

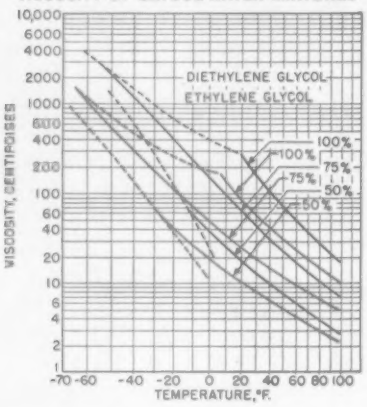
EASE OF SEPARATION

Ethylene glycol-water solutions are easier to separate at very low temperatures than diethylene glycol-water solutions.

This advantage is illustrated in the graph below. At 0°F. the viscosity of a 50 per cent ethylene glycol solution is 20 centipoises, or half the viscosity of the diethylene glycol solution.

An even more marked difference is shown at lower temperatures . . . at—40°C. a 75 per cent ethylene glycol solution has a 300 centipoises viscosity, as compared with 1000 to 2000 for a 75 per cent diethylene glycol solution.

VISCOSITY OF GLYCOL-WATER MIXTURES



COST

Ethylene glycol costs 1¾¢ a pound less than diethylene glycol which means a possible tank car savings of $1,300.

VAPORIZATION

Although ethylene glycol vaporization losses are greater than diethylene glycol's, the difference is insignificant below 30°F., if separator pressure is 750 PSI or higher.

SOLUBILITY

At separation temperatures of 60°F., glycol losses due to solubility should be in the range of 10 to 50 ppm when 50 to 75 per cent ethylene glycol solutions are used; and 20 to 100 ppm with equal strength diethylene glycol.

The higher volatility of ethylene glycol must be taken into consideration in regeneration equipment design and operation; but ethylene glycol may offer advantages in certain systems. Your CARBIDE Technical Representative can show you data on the pros and cons of ethylene or diethylene glycol hydrate inhibition in your system.

For a copy of a new report, "The Glycols as Hydrate Point Depressants in Natural Gas Systems" and a comprehensive bibliography of all the major articles published on gas sweetening and dehydration in the last 25 years, use the coupon.

UNION CARBIDE is a registered trade mark of Union Carbide Corporation.

UNION CARBIDE CHEMICALS COMPANY, Division of Union Carbide Corp., 270 Park Ave., N. Y. 17, N. Y.

Please Send Me

- ☐ Technical data report—"The Glycols as Hydrate Point Depressants in Natural Gas Systems."
- ☐ 24-page Gas Sweetening Bibliography.
- ☐ Please have a CARBIDE Technical Representative call.

NAME:..... POSITION:.....

COMPANY:.....

ADDRESS:.....

CITY:..... STATE:.....

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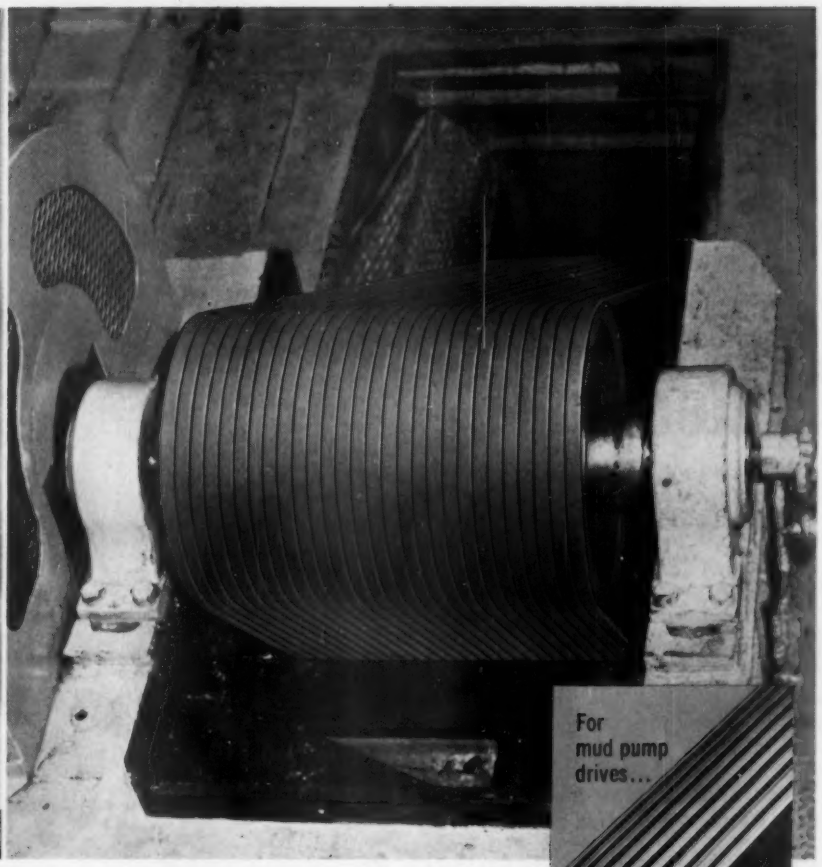


Gates Super HC V-Belt Drives save you up to 50% in space, 20% in weight and cost

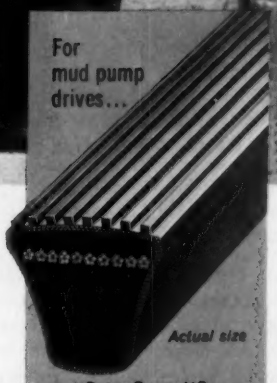
Because of basic changes in V-belt shape and construction, Gates Super HC High Capacity V-Belts can handle up to 3 times the horsepower of conventional V-belts in the same space. Or the Gates Drive can transmit the same power as conventional V-belts in ⅓ to ½ the space.

With this greater horsepower-carrying capacity, fewer Super HC V-Belts are needed . . . sheaves can be smaller and lighter in weight. This reduces your cost for a V-belt drive by as much as 20%. Drive weight is also reduced about 20%, lowering bearing loads, increasing bearing life. Guards and machine housings can be smaller and lighter in weight, reducing material costs and making portable equipment more compact. Moreover, the Super HC Drive can operate at belt speeds up to 6,000 ft/min without dynamic balancing, often permitting use of lower cost, higher speed engines.

The local Gates Man serving your area is a drive design expert. Contact him for drive design aid and for complete technical information, by calling your nearby Gates-stocked supply house.

The Gates Rubber Company, Denver, Colorado

BPS7



For mud pump drives...

Actual size

use Gates Super HC Rib Top V-Belts, specially designed to handle the exceptionally heavy work loads and shock and vibration conditions of mud pump service.

Gates

Building the future on 50 years of progress.

Gates Super HC V-Belt Drives

WHEN WEAK FORMATIONS THREATEN

Better call Halliburton!

When field history or mud loss warn of impending thief zones, call on Halliburton for help. Why?

Because Halliburton has the equipment, materials, and experience to help avoid circulation loss of cement.

For example: Halliburton Roto Wall Cleaners can be operated to leave mud cake across porous zones and still remove it elsewhere — providing the best possible cement bond. Also, Halliburton has designed special tools intended to support the cement load and lessen the possibility of a formation breakdown. Custom-blended Halliburton cements and additives lighten the cement column and help bridge-off porous intervals.

Most important of all, the men from Halliburton have experience . . . experience that only Halliburton can provide after having performed over *three million service jobs*. Next time you anticipate cementing problems due to lost circulation, call Halliburton . . . you'll be glad you did!

Cement Baskets

CIRCULATION MAINTAINED ... CASING CEMENTED!

Formation Packer Shoe

"DV" Multiple Stage Cementer

Here's how these products are designed to meet this objective:

GILSONITE CEMENT By adding volume but not weight to a slurry, Gilsonite provides a low-density, light-weight cement column. Its graded particle size offers superior bridging characteristics for better control of lost circulation.

CEMENT BASKETS These specially designed devices help support the cement column until it sets. Flexible steel staves and the heavy-duty waterproof canvas insert open to provide support when the hydrostatic column loads them from above.

FORMATION PACKER SHOE Wherever conditions require setting casing above a producing or thief zone, Halliburton's Formation Packer Shoe is specifically designed to help protect low pressure formations from cement contamination. The upper Super Seal Valve helps float the string into position and keeps the slurry from backing up inside the casing. The lower Super Seal Valve permits passage of the cement through the ports above the expanded packer but not through the end of the shoe.

"DV" MULTIPLE STAGE CEMENTER In areas of probable loss of cement circulation, Halliburton's "DV" tool is usually recommended. This tool permits cement placement in two or more stages to provide protection to the formation from excessive cement loading. After placing the lower cement stage in the regular manner, the "DV" tool is opened and closed with special plugs. This enables the slurry for the second stage to pass through the cementing ports directly into the annulus, thus reducing the cement load on the weak formations below.

DISCUSS LOST CEMENT CIRCULATION PROBLEMS with your Halliburton man... he'll suggest a program tailored to your specific needs.

275 Service Centers
... just minutes away from your well!

CEMENTING SERVICES

Halliburton
COMPANY • DUNCAN, OKLAHOMA

THESE PUMPS REACH DEEP TO DELIVER SECONDARY RECOVERY SOURCE WATER AT ROCK BOTTOM COST

PEERLESS PUMP

On almost continuous duty, at settings ranging from 30′ to 1400′ these Peerless Vertical Line Shaft Pumps drastically reduce water flood expenses...

Whether your source water is shallow or extremely deep, the Peerless vertical line shaft pump is the ideal pump for a steady dependable flood water supply. That's because it is big enough to do the job—up to 15,000 BPD from well depths to 2,000 feet; it is flexible enough to fit any water flood project; and it has been proved on the job over periods of up to six years of continuous flood water supply service.

Moreover, Peerless vertical line shaft pumps are specially built for the rigorous duty of handling corrosive fluids encountered in flooding operations. An informative bulletin B-102 on these pumps is available upon request. Write for your copy now.

Putting Ideas to Work

fmc

PEERLESS PUMP

HYDRODYNAMICS DIVISION

Plants: Los Angeles 31 California, and Indianapolis 8, Indiana.

Offices: New York; Detroit; Chicago; Cleveland; Indianapolis; St. Louis; San Francisco; Atlanta; Plainview; Lubbock; Phoenix; Albuquerque; Los Angeles; Fresno.

Distributors in principal cities.
Consult your telephone directory.

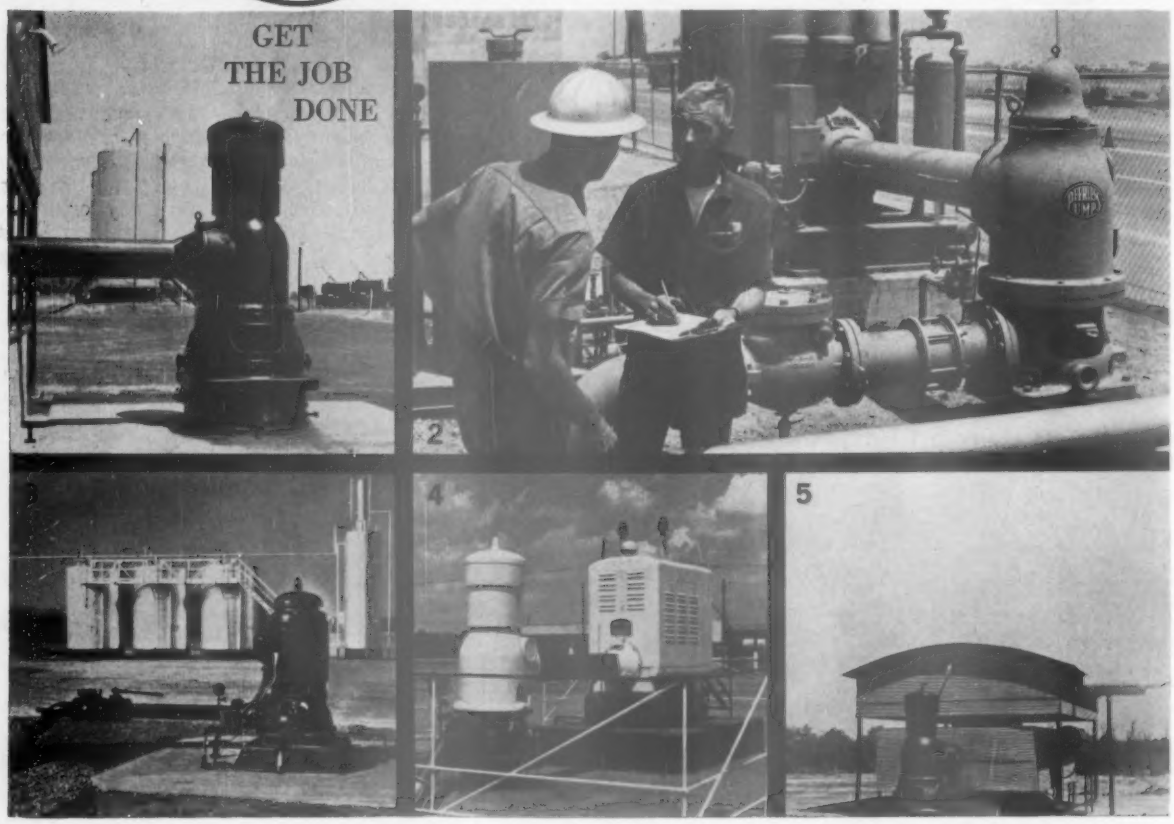
1 These pumps were installed when other water lifting pumps proved extremely costly to maintain. Embodying custom features in a production pump, these units afforded owners immediate cost savings that will soon repay original purchase price.

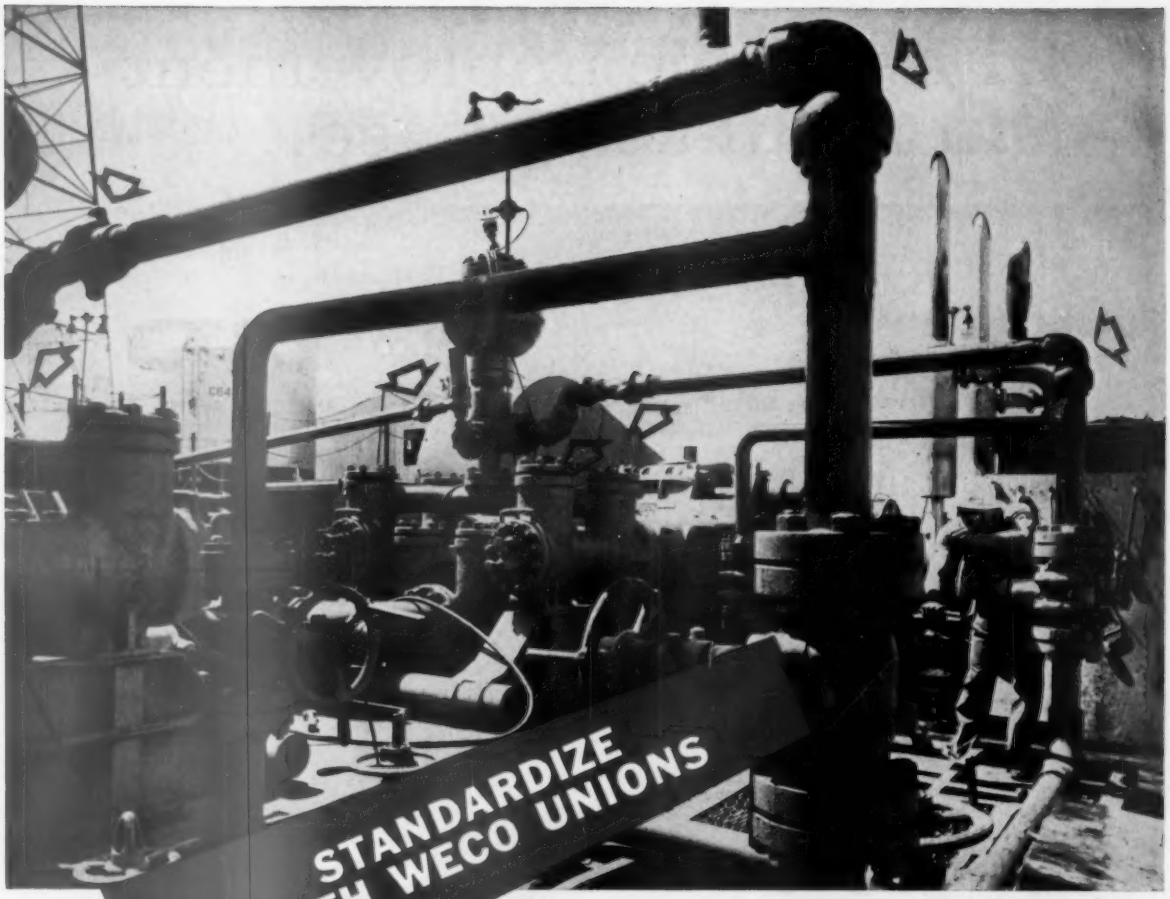
2 Peerless line shaft pumps are extremely flexible. They are adaptable to all types of drives. In this installation, the engine driven pump is providing an efficient flow of flood water for the Richfield Oil Company at Long Beach harbor field.

3 Power savings of $1,200 per month per pump were realized when four Peerless deep setting vertical line shaft pumps were chosen to replace obsolete methods. Pumping 15,000 BPD each, these pumps have proven most economical and dependable.

4 Producing 5,000 BPD from a 1400′ setting, this pump is one of four in service on a 4500 acre water-flood project in the Crescent Field, Logan Co. Oklahoma. Use of natural gas engine saves expense of electrical power sources.

5 This is one of four Peerless units in the Sholem Alechem field Stephens Co., Oklahoma. Using natural gas fuel, these pumps have delivered over 50 million barrels of water at a cost of less than 2 mils per barrel. This cost is 1/5 of that experienced by pumps using electricity for power.



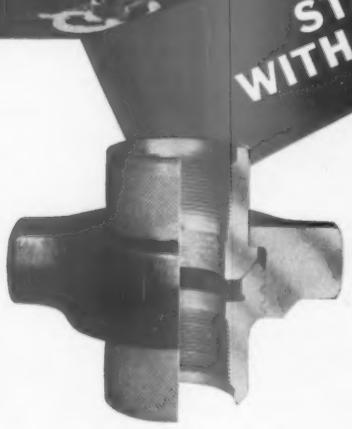


the key to new economy and efficiency in rigging up

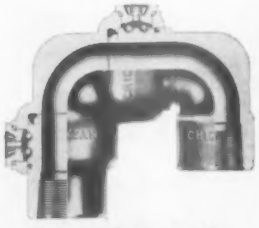
Operators report that standardizing with WECO Unions has cut many hours off rig-up and tear-down time . . . has simplified piping make-up . . . eliminated leaks and streamlined rig efficiency.

A big plus value of Standardizing with WECO Unions is the ability to switch equipment from one rig to another without changing piping or connections. WECO Unions are perfectly interchangeable in the same size and pressure rating. The heavy wing nut, the strong acme threads, the famous ball and cone seat resist the roughest, toughest oil field service on well after well.

WECO Unions, in sizes and pressure ratings for every oil field service, are available at Supply Stores everywhere. For further economy, combine WECO Unions with their companions Chiksan Swivel Joints for lower cost and greater flexibility in your discharge hoses.



WECO FIG. 602 UNION
6000 psi test
Sizes: 1" through 4"



CHIKSAN SWIVEL JOINT
Style 50 6000 psi test
Sizes: ⅜" through 4"

WECO WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS
Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

U-1-61

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WECO UNIONS | CHIKSAN SWIVEL JOINTS | HAMER LINE BLIND VALVES | HAMER PLUG VALVES | WECO AIR-O-UNION | WECO COMPOUNDS | WECO SNATCH BLOCKS

First basic improvement in multi-use grease...

NEBULA® EP-1

Now you can buy a *multi-use* grease that generally outperforms most *special purpose* greases! NEBULA EP-1 is especially developed for tough jobs — where heat, water, oxidation or heavy loads have previously limited the use of a multi-use grease. The unique formula of NEBULA EP-1 gives superior equipment protection . . . with all the economies you expect from multi-use grease. Order NEBULA EP-1 from your nearest Humble Bulk Plant, or call Humble Oil & Refining Company, Houston, Texas.

NEBULA EP-1 offers these economies:

- *One* grease bought in quantity — tubes, pails or drums
- Reduced inventory and handling
- A multi-use grease always handy

HUMBLE OIL & REFINING COMPANY

America's Leading ENergy COmpany

ENCO PRODUCTS

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Whatever your special fire hazard, Grinnell has the right system for you

The basic fire extinguishing agents are shown on the chart below with the most common applications cross-referenced by check marks. If your process requires a specially designed system — the research and test facilities of the Grinnell Company stand ready to serve you.

Extinguishing blanket of foam completely covers the floor of this aircraft hangar. 5,897 foam-water sprinklers protect property worth a billion Air Force Defense dollars.

Water spray, applied to outside storage of paints and solvents, cools to inhibit internal pressure build-up and dilutes to prevent flammable vapor-air mixtures from developing.

SPECIAL FIRE HAZARD	WATER SPRAY	FOAM	CARBON DIOXIDE	DRY CHEMICAL
AIRCRAFT HANGARS	✓	✓		
ALCOHOL STORAGE	✓	✓	✓	
AMMUNITION LOADING	✓			
AMMUNITION MAGAZINES	✓			
ASPHALT IMPREGNATING	✓			
BATTERY ROOMS			✓	
CARBURETOR OVERHAUL SHOPS	✓	✓	✓	✓
CLEANING PLANT EQUIPMENT	✓	✓	✓	✓
DOWTHERM	✓			
DRYING OVENS	✓		✓	✓
ENGINE TEST CELLS	✓	✓	✓	
ESCALATORS, STAIR WELLS	✓			
EXPLOSIVES: MANUFACTURING, STORAGE	✓			
FLAMMABLE LIQUIDS STORAGE	✓	✓	✓	
FLAMMABLE SOLIDS STORAGE	✓			
FUEL OIL STORAGE	✓	✓		
HANGAR DECKS	✓			
HYDRAULIC OIL, LUBRICATING OIL	✓		✓	
HYDRO-TURBINE GENERATORS	✓		✓	
JET ENGINE TEST CELLS	✓	✓	✓	
LIGNITE STORAGE AND HANDLING	✓			
LIQUEFIED PETROLEUM GAS STORAGE	✓			
OIL QUENCHING BATH	✓	✓	✓	✓
PAINTS: MANUFACTURING, STORAGE	✓	✓	✓	✓
PAINT SPRAY BOOTHS	✓		✓	✓
PETROCHEMICAL STORAGE	✓	✓	✓	
PETROLEUM TESTING LABORATORIES	✓		✓	
PRINTING PRESSES			✓	
REACTOR AND FRACTIONATING TOWERS	✓		✓	
RECORD VAULTS			✓	
RUBBER MIXING AND HEAT TREATING	✓		✓	
SHIPBOARD STORAGE	✓		✓	
SOLVENT CLEANING TANKS		✓	✓	✓
SOLVENT THINNED COATINGS		✓	✓	✓
SWITCHGEAR ROOMS			✓	
TRANSFORMERS, CIRCUIT BREAKERS (outdoors)	✓			
TRANSFORMERS, CIRCUIT BREAKERS (indoors)	✓		✓	
TURBINE LUBRICATING OIL	✓	✓	✓	✓
VEGETABLE OIL, SOLVENT EXTRACTION	✓	✓		

There's a Grinnell Fire Protection System to protect your property. You benefit from over 90 years of fire protection experience when you rely on Grinnell. Send for this free 44-page booklet today. Write Grinnell Company, Providence 1, R. I.

PIPE

The Orange Bands of Youngstown mark the world's most complete line of Oil Country Tubular Goods

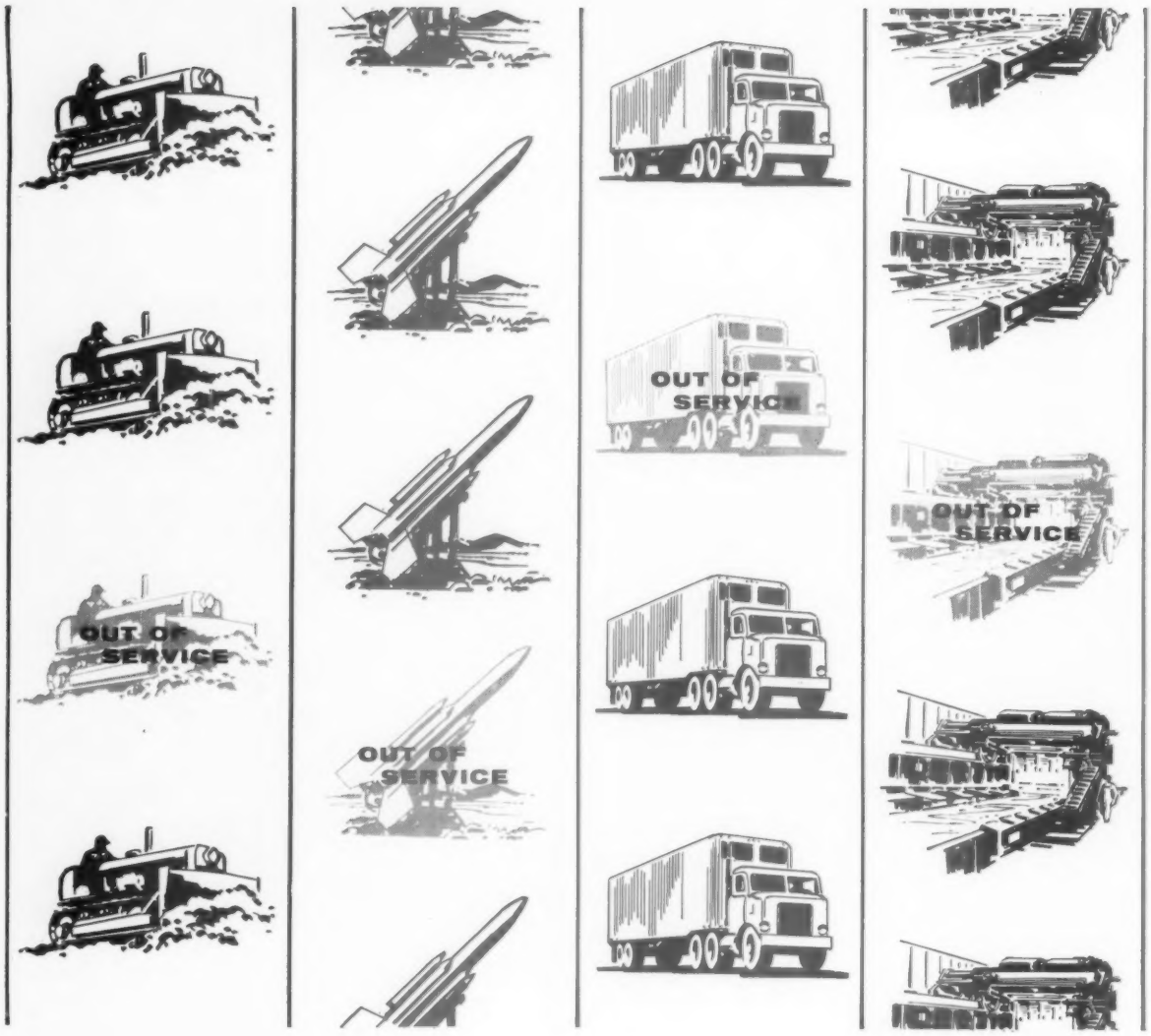
Take a mountain side. An offshore rig. Or a far out desert site. Take a tough, deep hole. A multiple completion. Or a sandy well. Wherever oil is, bring it in better with Youngstown Orange Band pipe. Bring it in more profitably with Youngstown . . . the world's most complete line of Oil Country Tubular Goods. You get exactly the pipe you need to meet any situation and every condition.

Select Youngstown drill pipe in standard or lightweights . . . 8 sizes, standard or premium grades . . . compatible with all tool joints. Order Orange Band casing in the widest range of sizes and grades. A.P.I. and Buttress T&C or Speedtite and Extreme Line integral joints. Specify Youngstown tubing from a complete line of sizes, grades, end finishes in A.P.I. or special non-A.P.I. upsets.

Orange Band quality is carefully controlled from ore to steel to final inspection by Youngstown specialists. And the largest field service engineering team in the Oil Country is ready to help you use it. You get fast delivery, too, from in-transit and full mill stocks. Specify high quality pipe from Youngstown for your next drilling job. The bold, bright Orange Bands tell you, you can't buy better.

Youngstown – growing force in steel

For details on Youngstown Orange Band tubular goods, write: Dept. 2-B,
The Youngstown Sheet and Tube Company, Youngstown, Ohio



Dependable ROLLWAY BEARINGS

help keep your down-time low

When a bearing "goes", your machine stops.

That's why it pays to call in Rollway. Especially when reliability is a must.

At Rollway, you can choose from a wide selection of sizes and types with maximum capacities . . . for normal, low or high temperature operation. All meeting or exceeding RBEC requisites in Classes 1 to 5.

You'll find that Rollway meets your needs exactly – in commercial grade, precision, or ultra-precision bearings. To get the bearing you want in a hurry, or to start R and D on the bearing you've been dreaming about, just call or write Rollway Bearing Company, Inc., Syracuse 1, New York.

Where So Much Depends on So Little . . . You can depend on

ROLLWAY®
BEARINGS
Radial and Thrust Cylindrical Roller Bearings

ENGINEERING OFFICES: Syracuse • Boston • Chicago • Detroit • Toronto • Pittsburgh • Cleveland • Seattle • Houston • Philadelphia • LosAngeles • SanFrancisco

FIRST CHOICE
of Oil Field equipment builders

NOW AVAILABLE FOR REPLACEMENT *at no extra cost!*

DIAMOND PRESS-FIT
CENTERPLATE ROLLER CHAIN

. . . supplied in custom lengths with **B**ushed **C**enterplate Connecting **L**inks

(Diamond Patent No. 2,466,639)

For many years DIAMOND *Multiple Strand* Roller Chain having centerplates Press-Fit on the pins has been *first choice* with builders of heavy-duty oilfield equipment . . . for these very good reasons:

1. DIAMOND *Press-Fit Centerplate* construction eliminates wear at centerplate holes. It distributes the load uniformly over *all* linkplates, giving the chain higher fatigue strength and greater capacity for shock or continuous loads, than has been experienced with any other chain.
2. Continued uniform distribution of load, even under severe operating conditions, adds substantially to the life of the chain, reducing replacement costs and equipment downtime.

DIAMOND *Press-Fit* roller chain is now available for installation or replacement in the field. Connecting links with precision-ground center-plate bushings (BCL Links) may be fitted with *hand pressure* and have virtually 95% of the shock load capacity of press-fit links.

DIAMOND *Press-Fit* Centerplate Roller Chain, for all its proven advantages, *costs no more* than slip-fit chain. It is available in multiple-strand, custom lengths from ¼" to 2½" pitch, for a complete range of oilfield applications.

Order DIAMOND *Press-Fit* Centerplate Roller Chain for all replacement needs. Available from Indianapolis factory or from Dallas Factory Warehouse.

DIAMOND CHAIN COMPANY, INC. · DEPT. 475 A SUBSIDIARY OF AMERICAN STEEL FOUNDRIES · 402 KENTUCKY AVE., INDIANAPOLIS 7, INDIANA

NEW DALLAS FACTORY WAREHOUSE AND SALES OFFICE ***carries full stocks of DIAMOND Roller Chains***
South and Southwest oilfield operators may now obtain overnight service on orders for DIAMOND Press-Fit Centerplate Roller Chain in *custom lengths* with Bushed Centerplate Connecting Links. Address your orders to: DIAMOND CHAIN COMPANY, INC. • 9119 Diplomacy Row, Brook Hollow • Dallas 7, Texas
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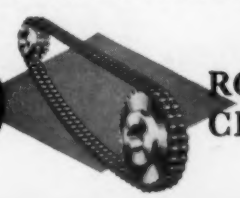


DIAMOND ROLLER CHAINS ®

THE TWO OUTSTANDING

PLATINUM REFORMING CATALYSTS

ENGELHARD
INDUSTRIES, INC.
CHEMICAL DIVISION
113 ASTOR STREET • NEWARK 2, NEW JERSEY

IMPORTANT NOTICE:

These two well established platinum reforming catalysts having distinctive product distribution patterns are now manufactured by Engelhard and supplied under a single license and catalyst supply contract. This new, singular service advantage allows you to choose the catalyst best suited to particular processing or economic conditions in a given installation. Greater latitude in reforming results thus assures maximum economy in each individual refining operation.

Investigate the unique performance of these outstanding platinum reforming catalysts. They provide longest periods of operation — *regeneration in situ!* They deliver important yield increases at high octane levels — *in existing equipment!* They reduce costs sharply—*to lowest level!*

An Engelhard representative will be glad to give you detailed information upon request. ★ ★ ★

PROMPT PRECIOUS METAL SCRAP RECOVERY SERVICE • ENGELHARD PROCEDURES RECOVER 100% OF ASSAYED PRECIOUS METAL CONTENT • IRVINGTON-BAKER REFINING DIVISION

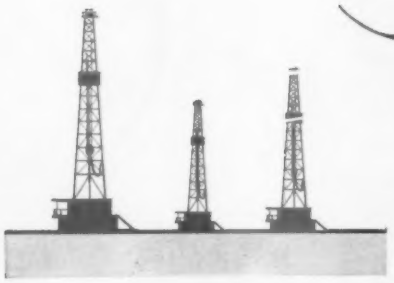
Another Field-Tested Milwhite Product for Reducing Well Costs

LUBRI-FILM

LUBRI-FILM is effective in preventing sidewall sticking

LUBRI-FILM reduces pipe torque

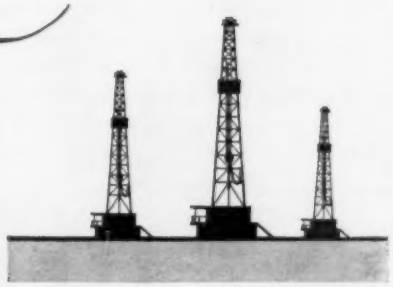
LUBRI-FILM is effective in preventing corrosion



From the Research Laboratories of

MILWHITE

MILWHITE MUD SALES COMPANY
HOUSTON, TEXAS
DIVISION OF MISSISSIPPI RIVER FUEL CORPORATION

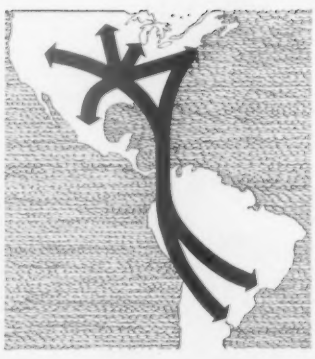


Braniff hospitality—at your service

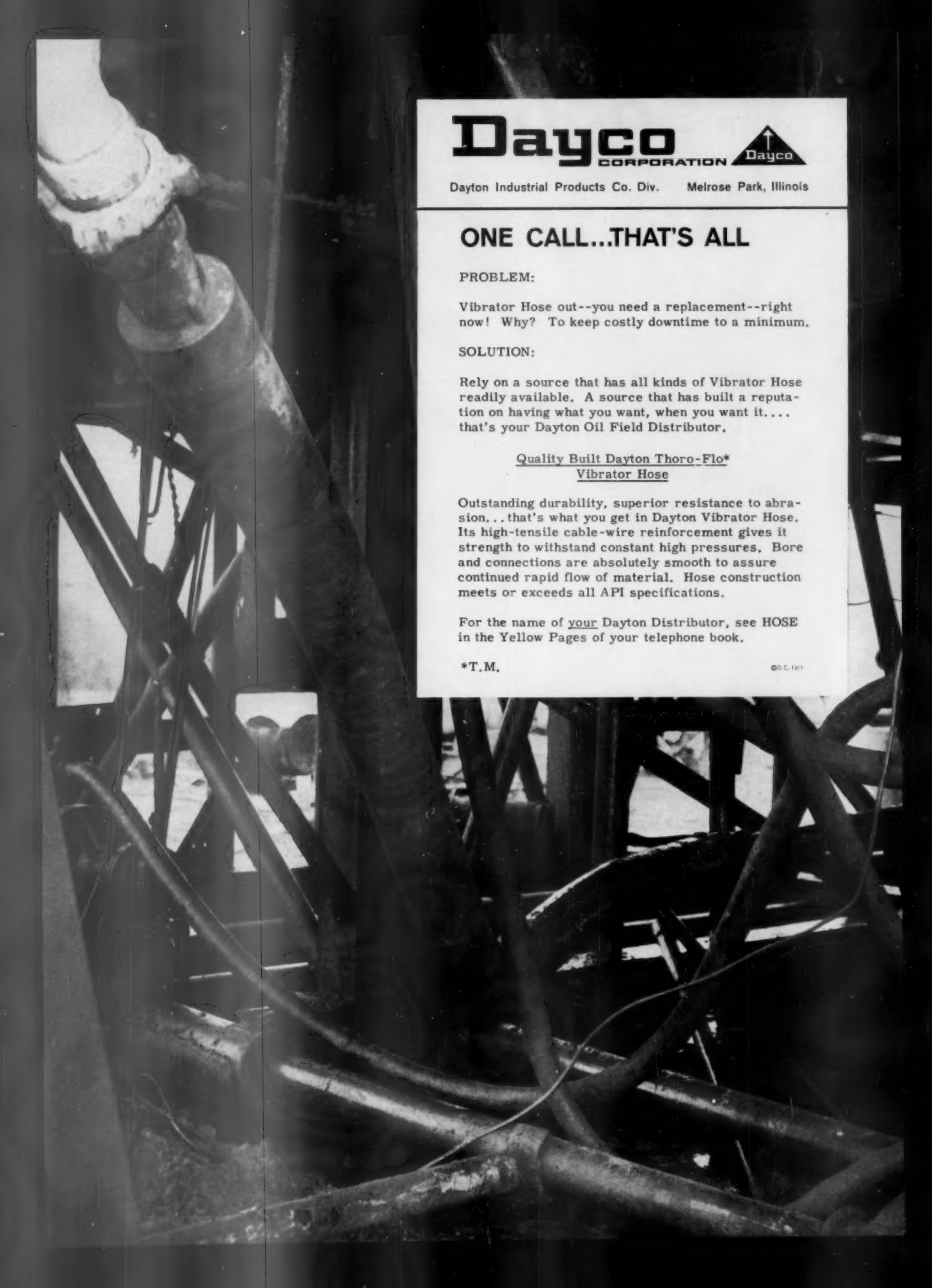
There is a song of promise in the whisper of a Braniff plane aloft. It sings of distant places and far away friends. It also sings of special hospitality—friendly service, the finest food on the best planes, relaxing comforts and efficient service that gets you where you're going on time.

Braniff hospitality serves 50 U.S. cities—with luxurious Super Jets between New York and Texas; Chicago and Texas; Minneapolis/St. Paul, Kansas City, Dallas, San Antonio and Mexico City.

Braniff hospitality will also take you in style to 10 Latin American countries. Oil, gas and other industries are flying high in Latin America. Try the pleasure of business or the business of pleasure in such glowing cities as Bogotá, Lima, Sao Paulo, Rio and Buenos Aires. Fly there in El Dorado Super Jet comfort. And let us help arrange tours—to make sure you see everything. Our new, low excursion fares are also most hospitable, by the way. Call Braniff or your Travel Agent.



BRANIFF *International* **AIRWAYS**



Dayco CORPORATION

Dayton Industrial Products Co. Div. Melrose Park, Illinois

ONE CALL...THAT'S ALL

PROBLEM:

Vibrator Hose out--you need a replacement--right now! Why? To keep costly downtime to a minimum.

SOLUTION:

Rely on a source that has all kinds of Vibrator Hose readily available. A source that has built a reputation on having what you want, when you want it.... that's your Dayton Oil Field Distributor.

Quality Built Dayton Thoro-Flo* Vibrator Hose

Outstanding durability, superior resistance to abrasion...that's what you get in Dayton Vibrator Hose. Its high-tensile cable-wire reinforcement gives it strength to withstand constant high pressures. Bore and connections are absolutely smooth to assure continued rapid flow of material. Hose construction meets or exceeds all API specifications.

For the name of your Dayton Distributor, see HOSE in the Yellow Pages of your telephone book.

*T.M.

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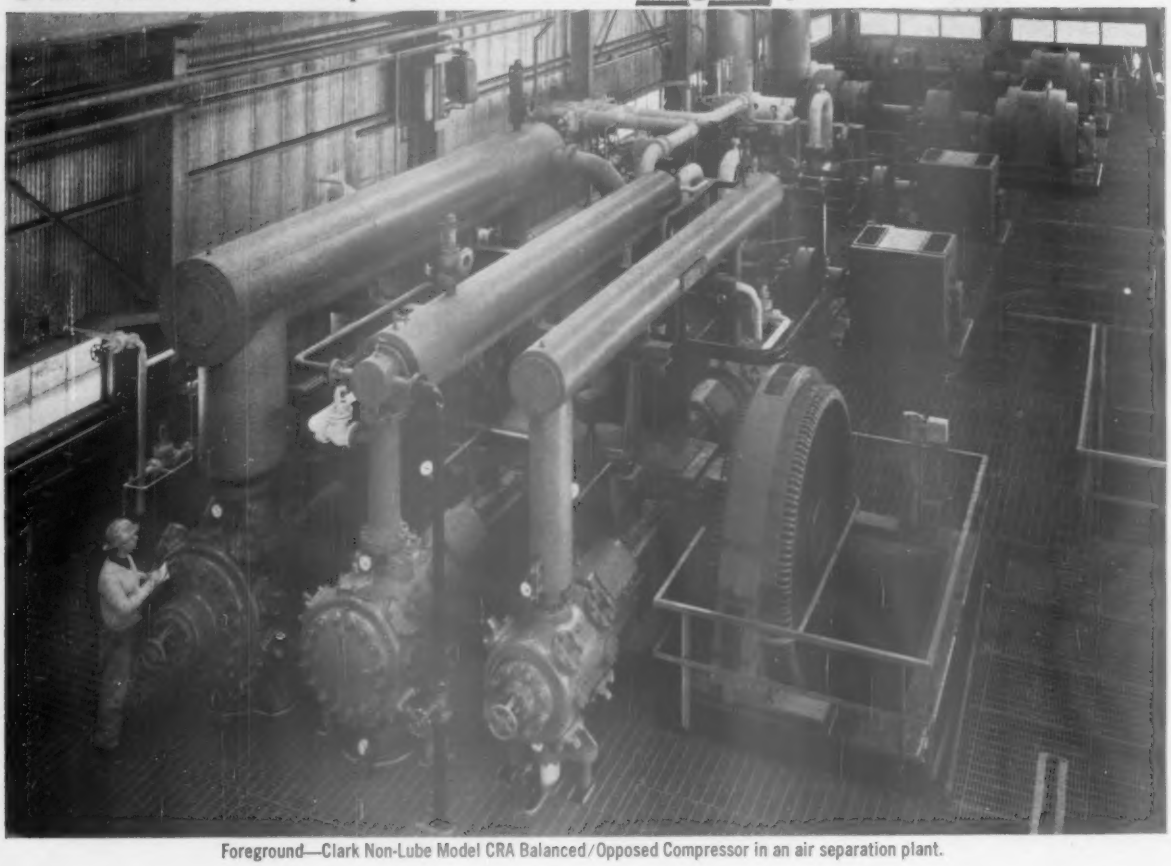
OVER 3000 HOURS ON STREAM...

Clark non-lube compressor still has original piston rings and trim!



Foreground—Clark Non-Lube Model CRA Balanced/Opposed Compressor in an air separation plant.

Uncontaminated nitrogen gas for a liquid oxygen refrigeration cycle is kept "bone dry" in this Clark Non-Lube Model CRA-6 Balanced/Opposed Compressor. Installed in Wheeling Steel's new air separation plant at Steubenville, Ohio, the 1250 bhp unit has shown remarkable dependability since startup. After going through initial blowdown, initial start-up, and 3000 hours on stream, the machine is still operating with its first set of piston rings and trim.

There are several reasons for this on-the-job endurance:

- The compressor operates at a conservative speed to hold down friction and temperature levels.
- Staging is extremely conservative—five stages are used to compress nitrogen from atmosphere to 565 psi.
- Non-lubricated, non-metallic piston rings, packing rings and riders are used to prevent hydrocarbon contamination of the gas stream.
- Compressor piston rods and cylinder liners are micro-polished to minimize wear and heat of friction.
- The non-lube cylinders are connected to the crankcase by extra long distance pieces. Lubricated areas of the piston rod do not enter the non-lubricated cylinder.
- Clark Balanced/Opposed design provides smooth, vibration-free performance. The foundation need only be large enough to support the weight of the compressor.
- Unit was furnished as a complete package with overhung motor, all intercoolers and interconnecting piping mounted on the compressor frame.

The new tonnage oxygen plant at Wheeling Steel is just one of many modern processes where Clark Balanced/Opposed Compressors have been specified because they can do the job best.

Air or gas, lube or non-lube, 75 to 8000 bhp, vacuum to 50,000 psi . . . Clark has the compressor—and the experience—to help you make the most profitable choice. The next time you plan a new facility, take advantage of them both. Contact your nearest Clark representative *first!*

CLARK BROS. CO. OLEAN, N. Y.

ROOTS CONNERSVILLE — Blowers, Compressors, Gas Pumps, Rootsmeters, Vacuum Blowers

Working together in allied industries . . .

PODBIELNIAK — Centrifugal Contactors, Distillation Apparatus, Instrumentation

CLARK — DRESSER INDUSTRIES INC. — OIL • GAS • CHEMICAL ELECTRONIC • INDUSTRIAL

Even heavy crude can't kill this foam!

AFROX® 200 FOAMS SATURATED SALT WATER AND OIL

AFROX 200 is extending the advantages of air and gas drilling to a wider range of hole conditions because it foams where other foaming agents fail. AFROX 200 was formulated specifically to combat salt water invasion. Extensive field tests proved its ability to handle heavy intrusion and, in addition, showed its performance to be virtually unaffected by the presence of oil.

Foamed in 60% Oil In the application pictured above AFROX 200 was used after heavy crude and salt water had matted cuttings in the annulus. A slug of 6 gallons of AFROX 200 in 12 barrels of water was used to foam out fifty to sixty barrels of oil, water and cuttings. The fluid in the hole was estimated to be 60% oil.

Two AFROX Formulas AFROX 200 foams all water containing more than 5% salt and in the presence of oil. Oil-bearing fresh water is easily foamed by injecting AFROX 200 in a salt water solution.

AFROX 100 is designed to foam relatively fresh and oil-free water. It may be used where the salt content is less than 5%.

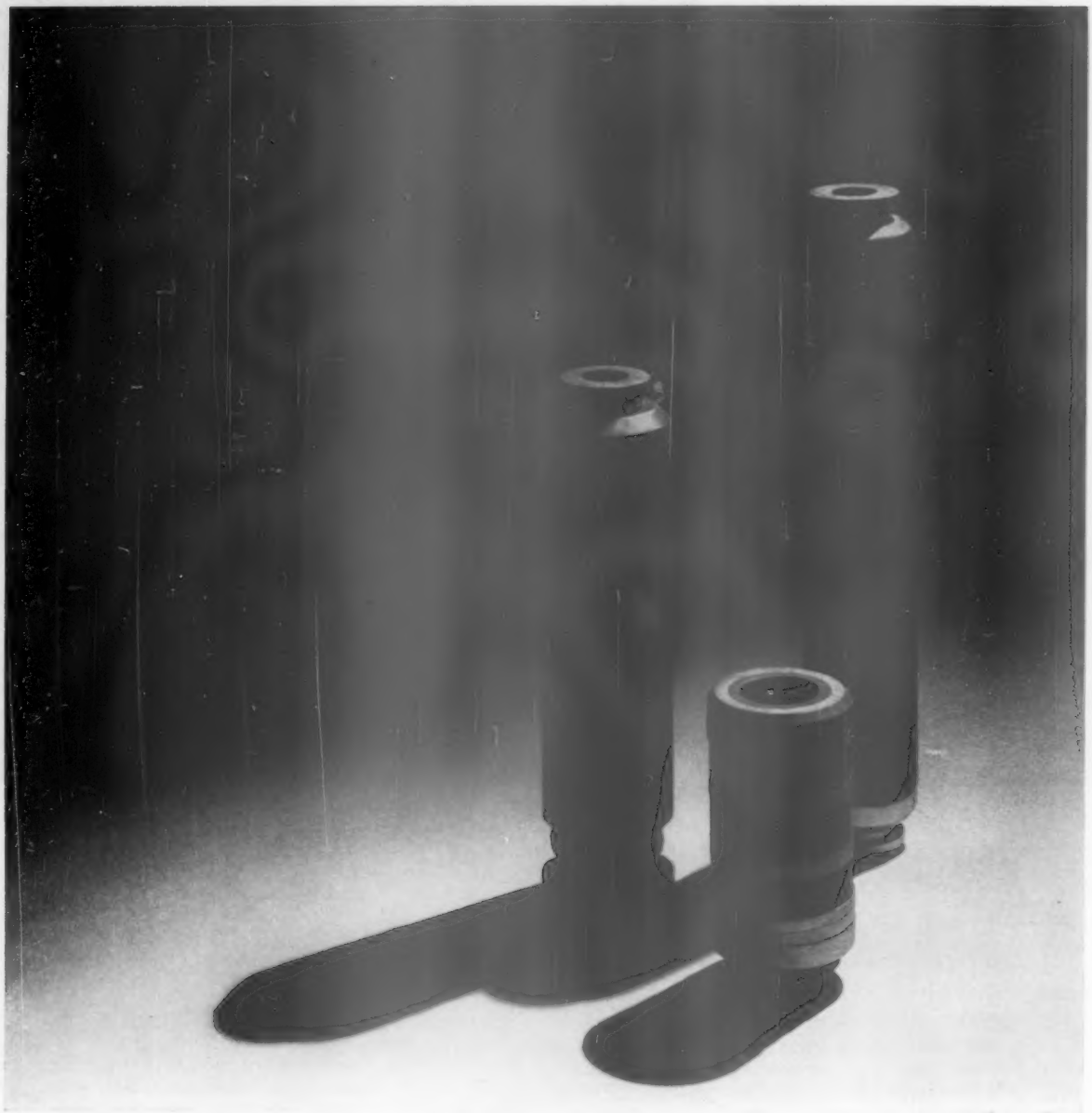
AFROX Foaming Agents are products of the Aquaness Department of Atlas Powder Company. They are distributed by leading mud companies and are available in all areas where air and gas drilling techniques are employed.

Write for new AFROX brochure, which gives complete information on the use of AFROX foaming agents.

ATLAS Aquaness CHEMICALS ATLAS POWDER COMPANY

Aquaness Department, Atlas Powder Company

P. O. Box 21072 • Houston 26, Texas



873,000

Johnston Testers' packers have worked successfully in 873,000 drill stem tests over a period of 35 years. In two tests below 20,000 feet, Johnston packers were set for 20 hours in 426° temperature and 22,045 psi hydrostatic pressure. Not one leak! They were pulled, redressed and run again, successfully. One was even used for the production packer after other brands failed!

Johnston packers set and release with simple movements. New rubber supports give greater rubber efficiency, allow more by-pass area for quicker and safer running as well as providing better pack-off performance.

Specially compounded rubber does not deform or deteriorate under extreme conditions. For instance, when the Full-Bore packer is released, it returns to original shape in a fraction of a second for quick, easy pulling. Unique gauge rings eliminate extrusion. Molly-coated slips reduce wear and friction. Hard, high-quality 4140 steel gives longer slip bowl wear.

Johnston packers are tough, built to give you the most accurate drill stem test available. And Johnston is continually working on more improvements. Another reason why Johnston Testers provides the best Drill Stem Test.

JOHNSTON TESTERS

Houston, Texas • Calgary, Canada

FIELD REPORT

FLOOD: New Harmony Unit

OPERATOR: Superior Oil Company

PUMPS: 4 Aldrich Quintuplex

FLOODING STARTED: May, 1957

EXPERIENCE TO DATE: Pumps continuously deliver mixture of fresh and produced water to two formations — 16,000 bbl/day at 1,450 psi.

Customer reports: "Aldrich pumps were selected because previous experience plus new improvements indicated that they better fulfilled our requirements.

"Pumps handling fresh water only have not been repacked since operation began thirty months ago."

FIELD PARTS AVAILABLE in Houston, Odessa, Alice and Wichita Falls, Texas; Casper, Wyo.; Hobbs, N. M.; Carmi, Ill.; Charleston, W. Va., Tulsa, Okla.; Los Angeles, Calif.; Calgary, Ontario. For further information, write the ALDRICH PUMP COMPANY, 9 Gordon Street, Allentown, Pa.

the tough pumping problems go to ALDRICH

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vastly improve your distillate fuels

at extremely low cost

UOP INHIBITORS AND ADDITIVES FOR TREATMENT OF DISTILLATE FUELS

POLYFLO™ *inhibitor-dispersants: Made in three formulations. Stabilize against thermal changes, color deterioration, sludge and deposit formation.*

DRIACIN® *dispersant-additive: Specially formulated for unstable heating and diesel fuels. Limits growth of colloidal particles, prevents clogging of filters, formation of rust in storage tanks.*

UOP COPPER DEACTIVATORS: *Two grades—80% and 50% active ingredient. Prevent trace copper interfering with action of inhibitors. Minimize color and sediment deterioration.*

No one inhibitor or inhibitor-dispersant can fully and effectively protect *every type* of distillate fuel. Each needs its own proper inhibitor selection, which must be determined on the basis of a comprehensive analysis of the fuel to be treated.

In response to this need, UOP offers a unique and highly valuable service that includes determining your precise inhibitor needs, based upon inspection and study of your fuels. From this analysis, we will determine the best inhibitor or most effective inhibitor blend recommended for each type of fuel you market.

Use of the correct inhibitor or blend of inhibitors for a given distillate fuel assures maximum stability at minimum cost. Reduced concentration of inhibitors also minimizes water absorption.

Refiners with distillate fuel marketing problems will find this service a must!

For our recommendations, send your distillate fuel samples to our Products Department—no obligation.

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30 Algonquin Road
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UOP

WHERE RESEARCH TODAY MEANS PROGRESS TOMORROW

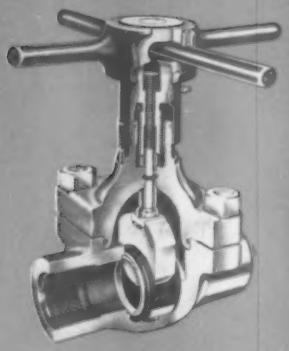


Figure 2126 Resilient Seat Gate Valve. 2", 3", 4", 2000 lb W.P. EValcoat protective Plastic Coating.

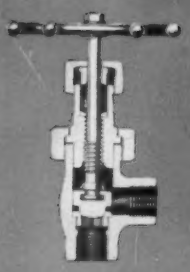


Figure 2699 Forged Steel Angle Valve. ½", ¾", 1", 2000 lbWOG. Not Plastic Coated.

Figure 152J Forged Steel Gage Valve. Size ½", 4000 lb WOG. Not Plastic Coated.

Figure 2698 Throttle Disk Forged Steel Globe Valve. Size 1", 2000 lb WOG. EValcoat Plastic Coating.

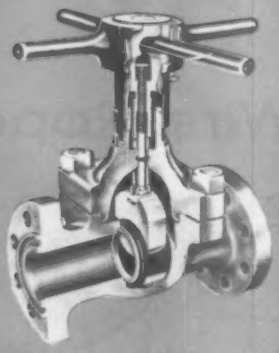


Figure 3116 Resilient Seat Gate Valve. 2", 3", 4", 2160 lb W.P. EValcoat protective Plastic Coating.

Figure 126 Forged Steel Strainer. Size 1", 2000 lb WOG. EValcoat protective Plastic Coating.

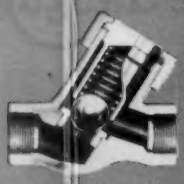


Figure 2676 Forged Steel Check Valve. Size 1", 2000 lb WOG. EValcoat protective Plastic Coating.

Figure 448 Forged Steel Globe Valve. 1½", 2", 2000 lb WOG. Not Plastic Coated.

NEW, BROADENED LINE OF ROCKWELL-BUILT EDWARD STEEL WATERFLOOD VALVES

Available with and without exclusive EValcoat* protective plastic coating

EDWARD STEEL VALVES
another fine product by
ROCKWELL

Now you can get service-proved Edward steel valves for every waterflood service . . . from pump house to well head.

You can get any size you need from ¼" to 4" and any pressure class to 3000 lb W.P. All types, too: globe valves, resilient-seat gate valves, check valves, gage valves and strainers.

For maximum corrosion resistance most Edward waterflood valves are available with exclusive "EValcoat" plastic coating, a premium feature at a modest price. Or you can get similar non-coated valves for those floods where plastic protection is not required.

For more information, see your favorite oilfield supply store, or use the handy coupon.

*EValcoat is a Trade Mark of Edward Valves, Inc. 6016

Edward Valves, Inc.
Subsidiary of Rockwell Manufacturing Company
1212 W. 145th St., East Chicago, Indiana

Please send me your new Waterflood Valves Catalog No. 14-J1.

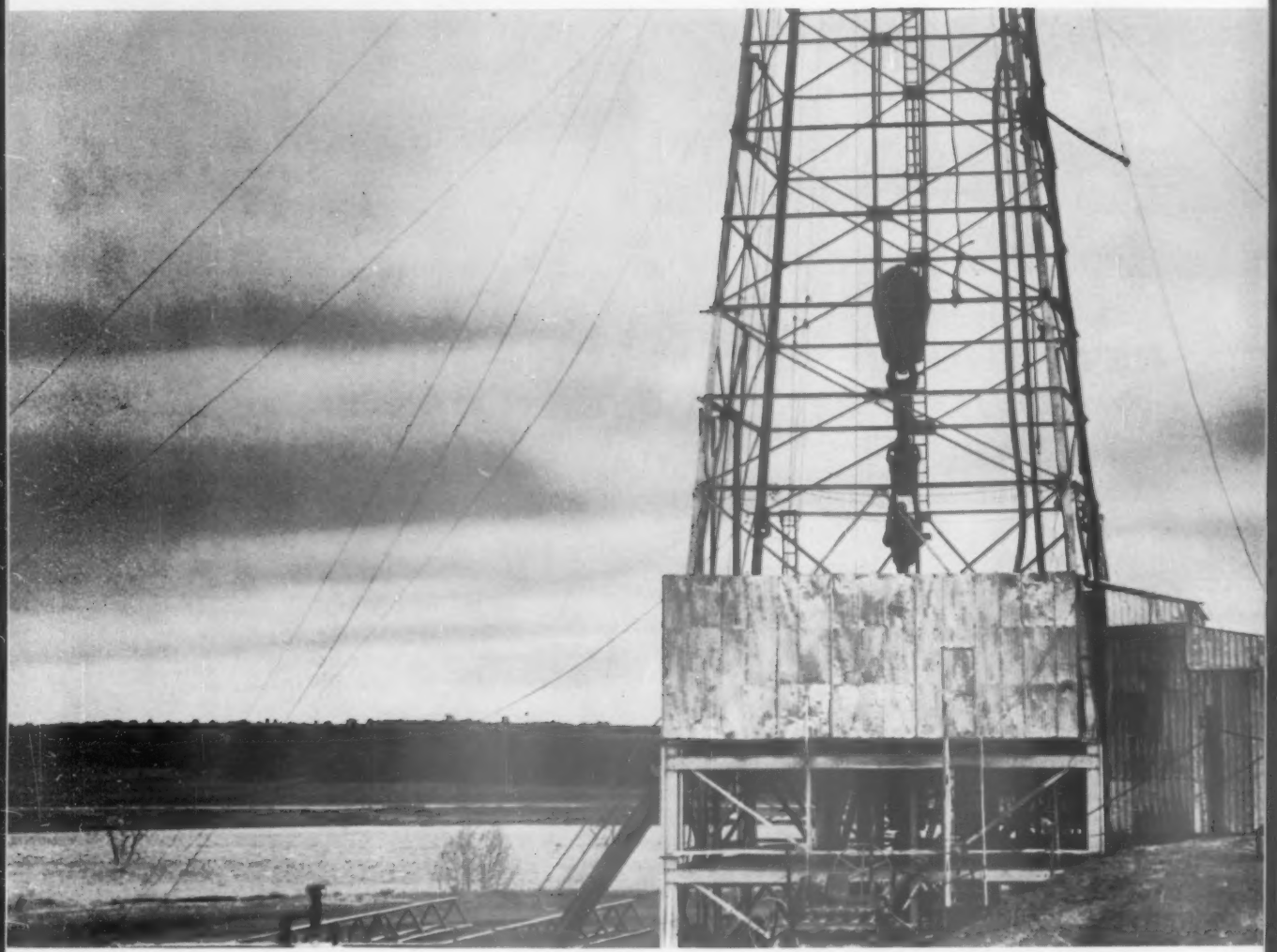
Name_____

Company_____

Street address_____

City_____ Zone_____ State_____

"We've used USS Tiger Brand Wire Rope



for 40 years—and our men still prefer it!"

Says Lee Daniel, Vice President in charge of operations

Helmerich & Payne, Inc., Tulsa, Oklahoma own some 34 rigs . . . and most of them are equipped with Tiger Brand wire lines. Mr. Daniel says, "We have tried many lines and our boys in the field would rather have USS Tiger Brand than any other line. We're looking for over-all efficiency and we're getting it. Tiger Brand gives consistently good service. The American Tiger Brand Sales Engineer is always on the job when we need special service. We've learned the various cut-off practices that are best—that really work. We keep good ton-mile records and pay attention to them when purchasing wire rope. That's why we've used Tiger Brand for 40 years."

Rig No. 44, shown here, was drilling to 16,000 feet near Chickasha, Grady County, Oklahoma. It was equipped with 7,500 feet of 1¼" Tiger Brand 6x19 Monitor Preformed Rotary Drilling Line with wire core. The crews had drilled to 15,300 feet in 162 days—*and had no trouble with this line.* They expect to get about 120,000 ton-miles from the line.

Mr. Carl H. Young, assistant to vice president, added this comment, "We would like to keep our maintenance figures as low as we can. Ton-mile records prove that we've made the right choice in Tiger Brand."

For complete information about various USS Tiger Brand lines for oil field service, write for our catalog, **American Steel and Wire, Dept. 1169, 614 Superior Ave., N.W., Cleveland 13, Ohio,** or contact our nearest distributor. *USS and Tiger Brand are registered trademarks*

American Steel and Wire
Division of
United States Steel

USS

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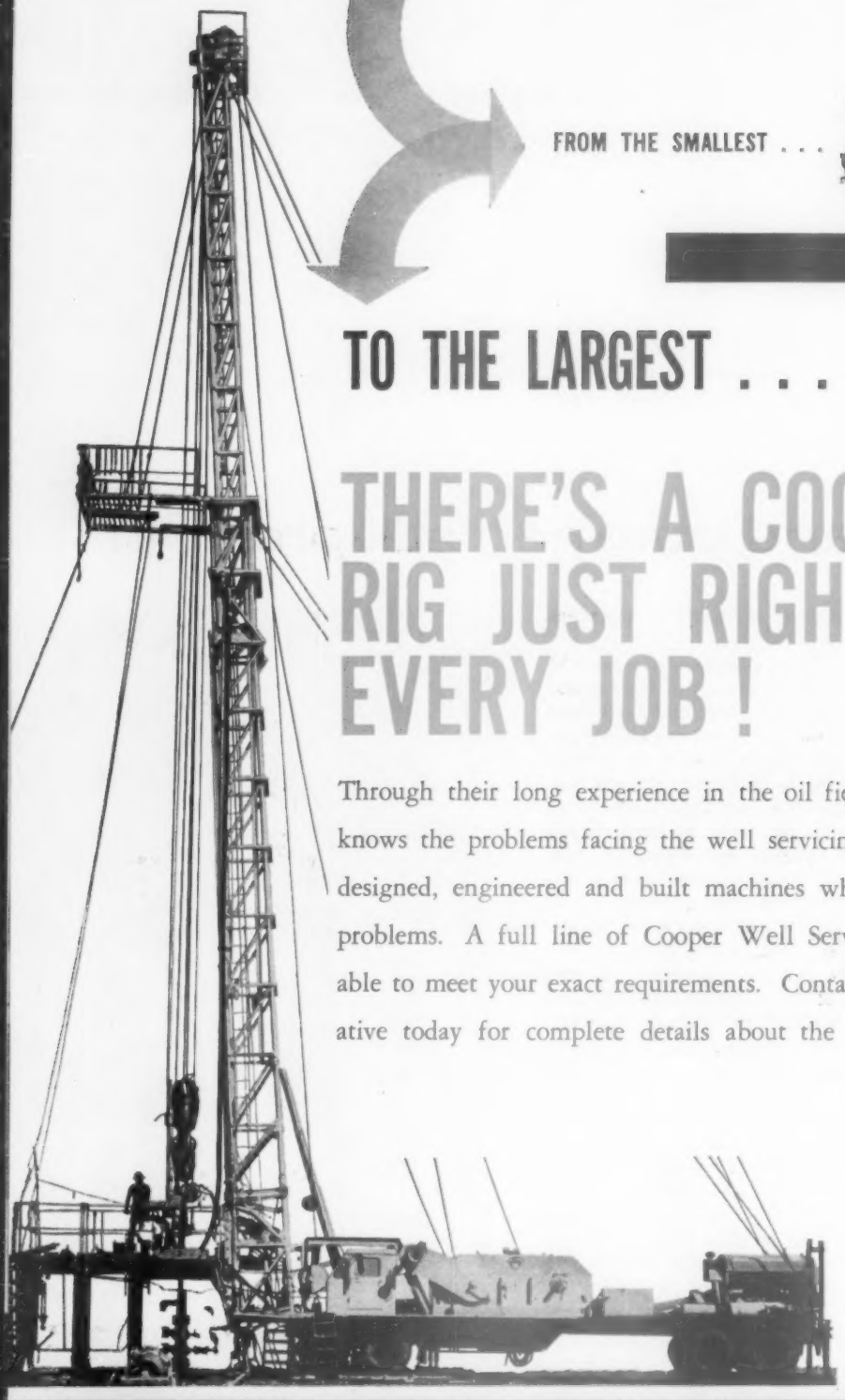
TO THE LARGEST . . .

THERE'S A COOPER RIG JUST RIGHT FOR EVERY JOB !

Through their long experience in the oil fields, Fred E. Cooper, Inc., knows the problems facing the well servicing industry today and has designed, engineered and built machines which solve many of these problems. A full line of Cooper Well Servicing rigs are now available to meet your exact requirements. Contact your Cooper representative today for complete details about the Cooper line.



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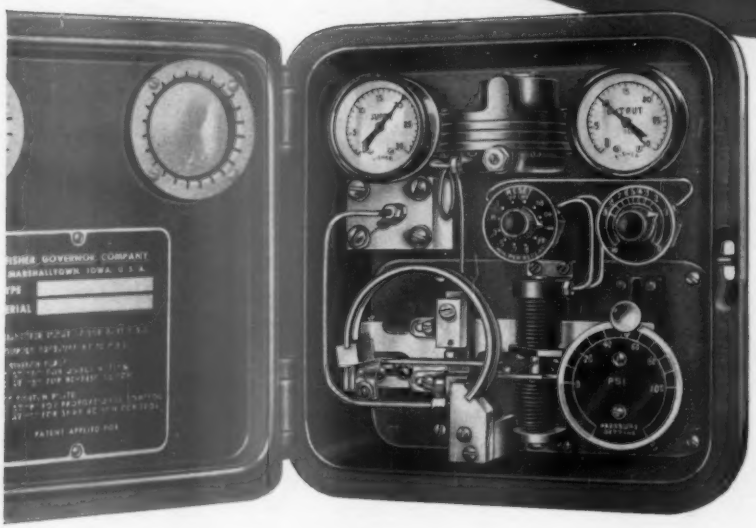
Branches: Houston, Odessa, Olney

the Fisher/man shows how to get.....

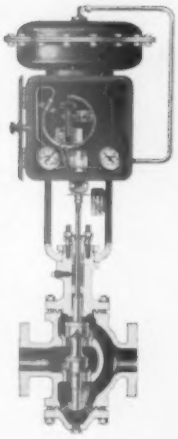
Accurate pressure control in spite of demand changes



WIZARD II
Pressure Controller

WIZARD I
PRESSURE CONTROLLER

The original Wizard I Pressure Controller is still available for those applications not requiring volume relay or reset features. The simplicity of a self-operated regulator and the accuracy of a pilot or relay operated regulator are found in the Series 4100U. This is, unquestionably, the reason for the continued popularity of the Wizard I series.



●Faster response to pressure changes provided by volume relay ●Pin-point control made possible by reset feature, adjustable from .005 to 1 minute per repeat ●Wide pressure ranges handled by brass, steel or stainless steel Bourdon tubes for 30 to 15,000 psi, Bellows assemblies for pressures below 30 psi and vacuum ●Easily reversed from direct to reverse action without additional parts ●Universal mounting on a wall, panel, or on yoke of control valve ●Compact construction consists of two sub-assemblies encased in weatherproof die cast aluminum housing, either can be removed without disturbing case mounting. *Write for bulletin No. D-4150B or D-4100 on Wizard I.* Fisher Governor Company, Marshalltown, Iowa. Plants in Woodstock, Ont., Rochester, England. Butterfly Valve Division: Continental Equipment Co., Coraopolis, Pa.

If it flows through pipe anywhere in the world ...chances are it's controlled by.....

FISHER® Controls SINCE 1880

Latest production tools . . .

J&L SUPPLY

Now ready . . . . complete data on Cabot pumping units, Jal-Con-Weld "50" macaroni tubing, portable waterflood packages, and Major meter automatic custody transfer units. These are sharp production tools for cost conscious producers. Be sure you have the latest information. Call your local J&L Supply man, or write us at Tulsa, 1427 South Sheridan Road.

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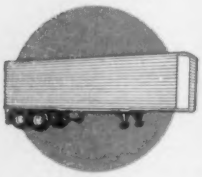
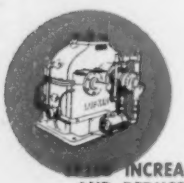


TRAILERS



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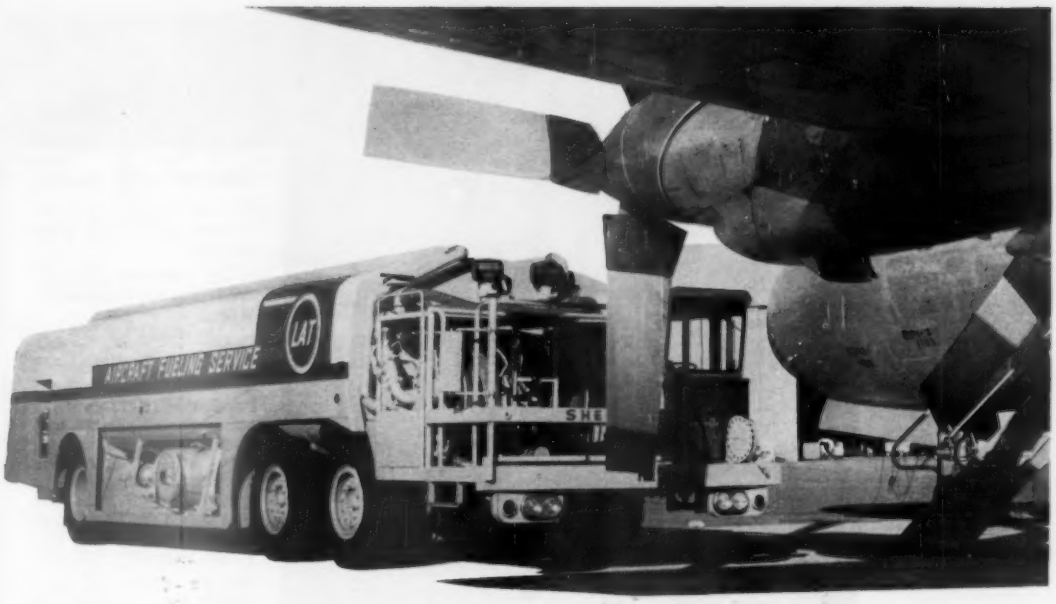

MODERN JETS DEMAND CLEAN JET FUEL

WARNER LEWIS EQUIPMENT DOES THE JOB!

Lockheed Air Terminal, Inc., a nationwide aviation fuel service company and a subsidiary of Lockheed Aircraft in Burbank, California, has quite a job—fueling modern day jet aircraft not only at Burbank, but many other locations throughout the United States, including Honolulu.

Since these jet aircraft demand clean fuel, Lockheed Air Terminal, Inc. uses Warner Lewis separator/filters in their fueling facilities — both stationary and mobile.

The Warner Lewis horizontal 2-stage separator/filter FCS 1362-20H1 with a capacity of 600 GPM of jet fuel is a standard on jet refuelers. Similar Warner Lewis designs are now used by the U. S. Air Force.

For further information, write the Aviation Products Division of Warner Lewis Company.

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WARNER LEWIS COMPANY
DIVISION OF FRAM CORPORATION
BOX 3096 TULSA, OKLAHOMA
IN CANADA: FRAM CANADA LTD., STRATFORD, ONT.

Unaflo oil-well cement,

CEMENTING DATA

Job — Hattie S. Welch #1, Jefferson Davis Parish, South Louisiana

Drilling Contractor — The Bullard Drilling Co., Inc., Houston, Texas

Owner — Austral Oil Company Incorporated, Houston, Texas

Job #1 — 7⅝" O.D. casing string set at 10,277' in 10⅝" hole, cemented with 500 bags UNAFLO cement plus 6% gel (slurry wt. 14.7 lbs/gal.) followed by 200 bags UNAFLO cement neat, (16.3 lbs/gal.). Drilling mud wt. 13.4 lbs/gal. Schlumberger temp. log 181° F. Est. static BHT 213° F.

Job #2 — 5½" O.D. liner, 2,146' long, bottomed at 12,000' in 6¾" hole cemented with 320 bags neat UNAFLO cement. Drilling mud wt. at cementing 16.4 lbs/gal. Schlumberger temp. log 255° F. at 12,160'. Est. static BHT 265° F.

Job #3 — 5½" O.D. full casing string tied to top of 5½" O.D. liner, using liner to casing coupling with 100 bags neat UNAFLO cement.

compatible with various additives...

UNAFLO oil-well cement is successfully used neat or with various types of additives in more and more cementing operations. For cementing casing or liner, squeeze cementing, plug-backs or recementing, UNAFLO cement slurries pump easily and set hard to provide an adequate seal. Its retarded set sustains high initial fluidity despite high temperatures and pressures. This allows time for proper placement plus a margin of safety for delays or emergencies.

For more information, write Universal Atlas Cement, 100 Park Avenue, New York 17, N. Y.

Universal Atlas Cement
Division of
United States Steel

U-163

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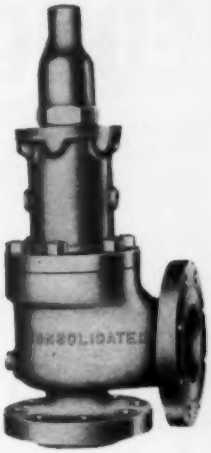
top

CONSOLIDATED SAFETY RELIEF VALVES have a special "O" Ring Seat Seal that stops leakage completely



Consolidated Safety Relief Valves are available in both Standard and Balanced Bellows design for extreme corrosive applications.

tightness

The Seal is a resilient ring set in the valve disc. It maintains no-leak tightness by contact with a specially curved seating surface on the valve nozzle, yet does not carry the seat load imposed by the valve spring.

Tightness is maintained at operating pressures far closer to set pressure than with metal-to-metal seats alone. Tight closure is as efficient after "simmer" as on normal blowdown. Piping strains are absorbed far better by the resilient seal than all-metal seating. If the tough seal is ruined by entrained abrasives, replacement is easy. Seals are available in materials that resist corrosive fluids. Maintenance costs are greatly reduced.

Standard Consolidated Safety Relief Valves have an eductor tube that removes pressure from the closed bonnet. Only the spring controls valve action. You get guaranteed capacity ratings and highest dependability—absolute protection for personnel and equipment. Additionally, there is the economy of converting the Standard valve to the Balanced Bellows type in your own shop. Get complete details. Write for Bulletin 1940.

MANNING MAXWELL & MOORE INC. TRADE MARK

CONSOLIDATED SAFETY RELIEF VALVES

A product of

MANNING, MAXWELL & MOORE, INC.

Valve Division • Tulsa, Oklahoma

Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario
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These are the men who REDUCE YOUR COSTS

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Minute-men are factory trained service men.

Interested in your service requirements.

Needless parts and repairs are eliminated because of their past service experience.

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Trained service men don't guess — they know.

Efficient controlled steps reduce your service costs.

Maintenance requirements reduced by minute-men servicing.

Economical service because minute-men are economy minded.

Net profits protected because properly serviced units have a longer life.

Use First Class Service
for First Class Servicing Units

WELL SERVICING AND DRILLING UNITS
FRANKS
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CABOT CORPORATION
MACHINERY DIVISION

The ROLO emblem

on metering equipment promises you accuracy and dependability

The accuracy and dependability of Rolo metering equipment have been demonstrated in oil fields around the world for years. Rolo, the world pioneer in metering equipment, produces a full line of metering equipment for every field need.

Rolo Oil and Water Meters. Rolo meters have few moving parts and ultrasimple controls. Free gas cannot damage the meter. They have no minimum rate, and the three-position valve used prevents flow of unmetered liquid. Two types of meters are available. Rolocheck® meters, with the accuracy required for royalty payments, are the most consistently accurate production meters available. Economy Line Meters offer Rolo quality in an inexpensive meter, providing necessary accuracy for well-test data.

Rolo Wellcheckers®. Wellcheckers are skid- or trailer-mounted metering units for testing individual wells. They are used where gas pressure can operate oil-gas separators. These completely piped units automatically separate and meter oil production. Optional equipment includes a gas meter and a built-in free-water knockout to remove and meter free water.

Rolo Metering Separators. Rolo produces numerous metering separators that separate and meter production. These integral units cost less than individual separators and meters. Two-phase metering separators separate oil and gas, and meter the oil. Three-phase units separate oil, free water, and gas, and meter both liquids. (Optional heaters or gas meters are available for both units.)

Rolo Hi-Cap® metering separators handle flow rates up to 50,000 bpd and meter crudes with viscosities higher than 100,000 SSU. These units are available in both vertical and horizontal models.

Rolo Metering Treaters. Rolo metering treaters use a thermostatically - controlled, gas - fired heater and a hay section to break emulsions efficiently. Oil and water are metered in the same vessel.

Rolo Metering Free-Water Knockouts. These units are used where gas pressure is not available. Pressure from the well pump is used to discharge liquids. Units can be mounted on trailers or skids.

Complete specifications on all Rolo metering equipment are given in our Condensed General Catalog. Ask your Rolo representative for a copy, or write to us at the address below.

ROLO MANUFACTURING COMPANY

P. O. BOX 22126, HOUSTON 27, TEXAS • SALES AND SERVICE OFFICES: DENVER, COLO.; ODESSA, TEXAS; NEW ORLEANS AND LAFAYETTE, LA. • CANADA: PETRO-AUTOMATION INDUSTRIES, LTD., EDMONTON, CALGARY AND REGINA
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They Say—

It was Ward, not Warden

Dear Sir:

I read with interest the item on page 96 of the May 15 issue in which the proposal of Mr. Wallace E. Pratt is mentioned ("Pratt Wants to Uncover Geological Boneheads").

My father's name was spelled "Warden" in the article instead of "Ward." It was he who completed the negotiations with Gulf in 1927 and with Standard Oil Co. of California in 1928, which negotiations he initiated. The negotiations culminated in his signing contracts in the United States for Eastern & General Syndicate, Ltd., of London.

These contracts have resulted in the successful development of British and American companies of the oil resources of Bahrain, Saudi Arabia, the Neutral Zone and Kuwait.

I am sure that my father will appreciate the thoughtful reference of Mr. Pratt.

T. E. Ward, Jr.
President
Oilfield Equipment Co.
New York

Petroleum hall of fame

Dear Sir:

Do you know if there is now in existence or in any stage of planning any museum pertaining specifically to the oil industry? I know that there are a number of exhibits included in city, college, and state museums, but I have not been able to locate any devoted exclusively to petroleum.

If there is none, it seems to me that if the petroleum industry could combine its talents, a very interesting and educational museum could be established, preferably somewhere in the Mid-Continent, to include a historical section with possibly a cable tool rig and a rotary, dioramas, scale models, old types of equipment, a reference section with literature, old catalogs, photographs, and a Hall of Fame to honor the outstanding men in the industry.

I think that if the program could

the OIL AND GAS JOURNAL

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HOKE Flow Sheet 5

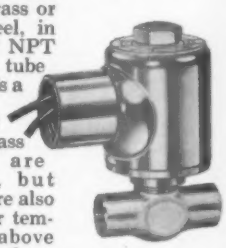
HOKE REPORTS ON FLUID CONTROL

WE'VE TOSSED A NEW BALL INTO AN OLD GAME

A VALVE NAMED "DESIRE"

With apologies to Tennessee Williams, we really have produced a Solenoid Valve line based on *your* desires. We surveyed all the solenoid valve users we could find to determine what *you* wanted. The result is Hoke's "User Designed" Series 90 and 95, two-way and three-way, direct-acting solenoid valve line.

Thanks to you, we have much to brag about. Here's what we have been saying about these new valves: lightest weight – smallest size – no-hum operation – lowest temperature rise – lowest power consumption – stainless steel plunger – silver AC shading coils – easiest installation – packless construction – 360° rotatable housing – operates in any position.



We make them of forged brass or stainless steel, in ⅛" and ¼" NPT size or JIC tube ends. There's a variety of AC and DC voltages. Class "A" coils are standard, but Class "H" are also available for temperatures above 212°F. For those with high insurance rates, we can supply explosion proof coil housings.

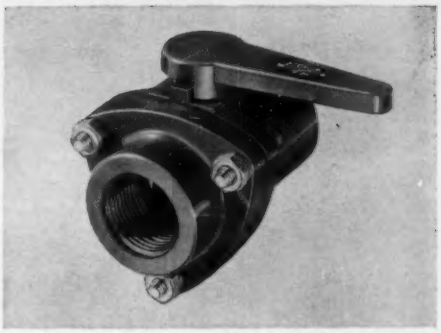
Now that we've bragged a bit, we must also apologize for our premature enthusiasm. We were so excited about this product that we stirred up a hornet's nest of interest before we were ready to deliver in quantity. Shipments were slow at the start, but now we can have any reasonable quantity of these "desirable" solenoid valves "on-stream" in your plant when you want them.

There's only one way to get conclusive performance proof – buy a valve. Ask for Bulletin SV-4-61.

A STEADY FLOW OF FACTS!

Further flow features, and interesting technical topics are carefully covered in Hoke's technical publication, the FLOW SHEET. It's free, but worth millions! To get the full benefit of our engineering and editorial efforts six times a year, mark your "X" in the proper box.

The technique of molding polyvinyl chloride into ball valve parts is old hat. Even the unplasticized compounds of type I PVC have been kicked around for a while (with minor successes). But until now, no one has booted the ball for a goal.



Perseverance, determination, and the pursuit of economic reward have prompted us to offer a line of ball valves molded of the toughest grade of type I, unplasticized PVC. There are no foreign agents to contribute to a corrosive demise, even in most caustic services. It even meets the proposed new ASTM specification and has a tensile strength of 8500 psi. Those who have had PVC piping problems will profit from the new molding process that gives these Hokes dimensional stability and very high impact strength. Sensitive systems, human and otherwise, are safe from contamination – they're absolutely non-toxic. We've set 140°F. as the operating temperature limit, but occasional excursions to 160°F. won't do any harm.

All standard models are supplied with a concentric hole drilled thru the ball. They can be heat welded, or solvent bonded right in the line. Piping hook-up is even simplified by their coupling-like assembly. Your assistant can fit each half of the valve to a pipe end, then reassemble the valve without having to turn the pipe. Pressures to 125 psi are duck soup for these valves.

A maintenance man's delight, they can be cleaned and have their seats changed without leaving the pipe. Their light weight makes them ideal for use on long, unsupported spans of pipe.

Size-wise, we're offering them in ½, ¾, 1, 1½, 2, and 3 inch sizes, all NPT female connections.

You will command the eternal admiration of your colleagues when you install these valves. Be the first to show your rightful status by ordering a shiny new Hoke polyvinyl chloride ball valve. If pride of ownership hasn't motivated you at this point, the mere fact that you are behind the scientific times should move you to find out more.

It isn't necessary to tell us why you want the additional information. Just check the coupon below. We'll forward the facts in a plain, brown envelope.

'61 PRODUCT PARADE

You'd be surprised at some of the screwball ways our valves have been used (to decided advantage, of course). Hoke distributors are armed to their maxillary third molars with this method madness and will redesign your systems (incorporating solenoid valves and PVC ball valves) at the drop of a postcard. Check the PRODUCT PARADE box.

Hoke's Performance Guarantee — *Every Valve Leak-Tested!*

HOKE, INCORPORATED
63 Piermont Road, Cresskill, N. J.

Send me complete information on the Hoke products checked below:

- ☐ PVC Ball Valves
- ☐ Solenoid Valves
- ☐ Product Parade
- ☐ Flow Sheet
- ☐ Complete Catalog GC960

NAME _____ TITLE _____

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CITY _____ STATE _____

SEE OUR CATALOG IN SWEETS PRODUCT DESIGN FILE

McKISSICK'S

NEW

Hinged Side Plate
SNATCH BLOCK

DESIGNED FOR QUICK OPENING

- Acme threaded nut, less turns to tighten.
- Nut is integral part of hinged plate, for ease of stringing up. No nuts or bolts to lose.
- Drop-forged, heat-treated steel. High-speed bronze bushings, or HI-LOAD roller bearings. Alemite lubrication.

ONE TURN AND IT'S OPEN

McKissick

McKISSICK PRODUCTS COMPANY
Drawer 768 • Tulsa, Okla.

be approached on a nationwide basis, with everyone desiring to do so being given a chance to participate, such a project would be met with a high degree of success.

If baseball, agriculture, and cowboys can have their Halls of Fame, why cannot the petroleum industry? Surely ours would be of greater historical and educational value than any of the others mentioned . . . It would, I am sure, have just as large or larger appeal.

William L. Page
Secretary
San Andres Exploration Co.

Reader Page has a good idea. There is presently a petroleum museum under consideration in Tulsa. Comments on this proposal would be welcomed by Mr. Page and by the Journal.—Ed.

The forgotten man

Dear Sir:

I have just read the editorial in your May 29 issue ("Bad Pricing Policies Are Oil's Greatest Weakness," p. 97) and the article on page 104 lamenting the oil marketers various problems, particularly in selling gasoline ("Marketers' Need Firm Prices, New Product Uses").

It seems to me that the marketing segment of the oil industry justly deserves all the problems they have and many more, simply because they have completely forgotten me, their customer.

This week I took my car to a service (?) station and asked for a grease job, oil change, filter change, and fill of gas. My total bill came to more than $13.

In return for this larger than usual order, the retailer did not do any of the following:

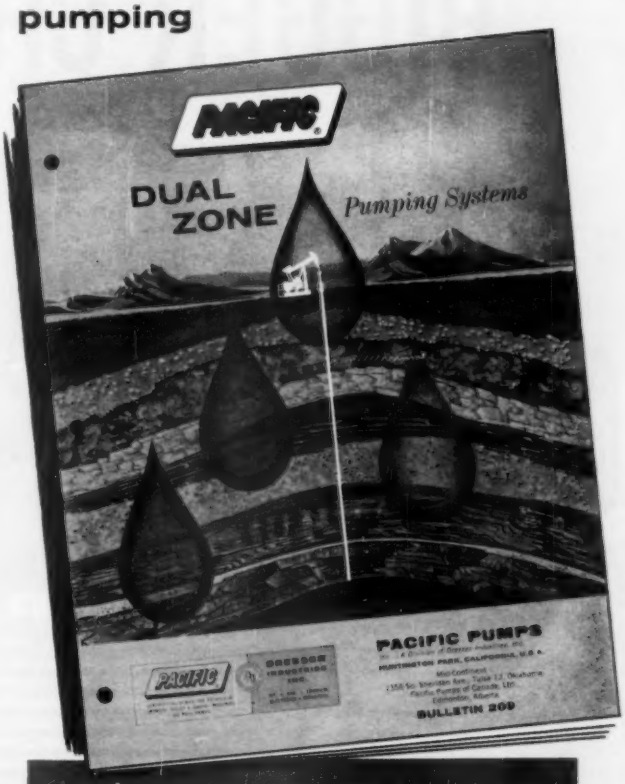
a. wash and polish the windows
b. check the tires, including spare
c. sweep out any of the floor mats
d. empty litter bag
e. lubricate door latches

As a customer, my investment in an automobile represents a major investment. I try to protect that investment by regular lubrication, etc. After such treatment as this, my confidence in trusting a $3,000 piece of equipment to this service station is somewhat shaken.

I have had similar experiences

Now!

PACIFIC PUMPS
brings you *(the most)*
economy and efficiency
for your dual zone
pumping



Write for Bulletin 209

PACIFIC DUAL ZONE pumping systems provide maximum economy in producing dual completed wells where co-mingling of zone fluids is not permitted. Both zones are produced from the same well bore, using a single rod string and pumping unit.

PACIFIC
CENTRIFUGAL PUMPS FOR PETROLEUM, CHEMICAL, UTILITY & GENERAL INDUSTRIES
OIL WELL PUMPS

PACIFIC PUMPS
Inc... A Division of Dresser Industries, Inc.
HUNTINGTON PARK, CALIFORNIA, U.S.A.
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1358 So. Sheridan Ave., Tulsa 12, Oklahoma
Pacific Pumps of Canada, Ltd.,
Edmonton, Alberta

'61 FORD SUPER DUTY TRUCKS

BROADER WARRANTIES... GREATER DURABILITY... BIGGER CHOICE!

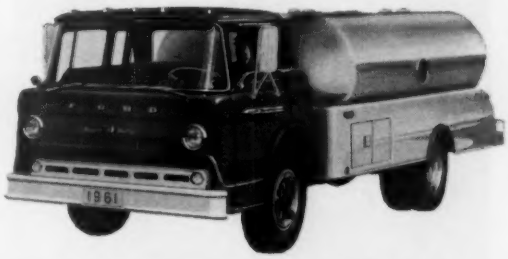
FORD DIVISION, Ford Motor Company

- **New Super Duty V-8 Dealer Warranty—100,000 miles or 24 months!**
- **New extended Dealer Warranty for entire truck line—12 months or 12,000 miles!**
- **New stronger frames and huskier cabs for Conventional Cab models!**
- **Now 222 money-saving Tilts, Tandems and Conventionals with Super Duty V-8's to choose from!**

Ford's rigid quality control program gives you unsurpassed dependability! Positive evidence of uniformly high production and inspection standards is the exclusive new 100,000-mile engine warranty. On 401-, 477- and 534-cu. in. Super Duty V-8 engines, each major engine part (including block, heads, crankshaft, valves, pistons, rings), when engine is used in normal service, is warranted by your dealer against defects in material or workmanship for 100,000 miles or 24 months, whichever comes first. Warranty covers the full cost of replacement parts . . . full labor costs for the first year or 50,000 miles, sliding percentage scale thereafter.

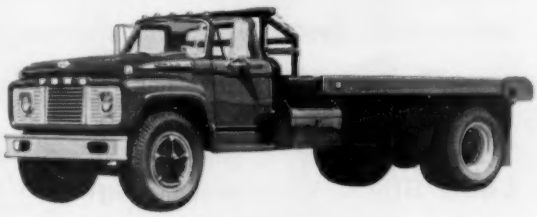
In addition, an extended warranty covers all 1961 Ford Trucks of any size. Each part, except tires and tubes, is now warranted by your dealer against defects in material or workmanship for 12 months or 12,000 miles, whichever comes first. The warranty does not apply, of course, to normal maintenance service or to the replacement as normal maintenance of such items as filters, spark plugs and ignition points. No other truck gives you such protection for your investment; never before could you be so confident of long-range durability!

Tandem Axle models are available with tilt cabs. As with conventional tandems, aluminum walking beams, wheels, fuel tanks are offered to cut weight.



Most popular Tilt Cabs on the American road! 1961 models represent five years of improvements. Four series—up to 36,000-lb. GVW, 65,000-lb. GCW.

New tougher tandems offer greater strength in chassis, cab and sheet metal . . . new wide-track front end stability. Powered by rugged Super Duty V-8's, Ford tandems go up to 51,000-lb. GVW, 75,000-lb. GCW.



New huskier conventional trucks feature lighter, stronger frames of high-tensile steel . . . heavier gauge metal and stress-isolating independent mounting for radiator, fenders and cab.

QUALITY-BUILT... MAINTENANCE-ENGINEERED

FORD TRUCKS COST LESS

Durable paints that keep uniform color

That's what you get when you specify paints made with M50® Basic Lead Silico Chromate pigment for your gas stations and tank trucks.

Keeping stations looking bright and inviting to customers can be a real problem. You can minimize this problem by specifying paints made with *M50*® Basic Lead Silico Chromate pigment—the pigment that puts anti-corrosion protection in every coat . . . plus weather resistance against fading and chalking.

M50 pigment provides "Defense-in-Depth"—keeps paint *uniformly* bright and attractive longer.

In addition to superior corrosion protection, *M50* pigment permits an *unusually wide range of color selection.* Paints made with *M50* pigment can be compounded in bright hues, soft pastels and other color variations to spruce up your gas station signs, pumps and tank trucks...make them attractive outdoor advertisements for your company.

Next time you buy paint for decorative metal protection, specify paints made with *M50* Basic Lead Silico Chromate—the pigment that puts anti-corrosion protection in every coat *and* provides durability, uniform resistance to weathering and wide color range.

M50 *an* **oncor** *Pigment...A Development of* **National Lead Company**

General Offices: 111 Broadway, New York 6, N.Y.

with other stations handling other brands.

Incidentally, I do not know what the gasoline price was; I went for service not gas price.

If the oil marketers would actually practice real service, the selling price of gasoline would become a smaller factor in their over all operations.

R. H. Breckenridge
Dallas

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

JUNE

19-23 Harvard University, School of Public Health, air cleaning institute, Cambridge, Mass.

19-23 Gordon Research Conferences, catalysis, Colby Junior College, New London, N. H.

20-22 National Association of Corrosion Engineers, Greater Boston section, corrosion short course, Wentworth Institute, Boston.

20-24 Canadian Gas Association, annual meeting, Banff Springs, Alta.

21-24 American Association of Petroleum Landmen, annual meeting, Shamrock-Hilton Hotel, Houston.

23 Southern Gas Association, transmission section, roundtable conference on gas pipeline right-of-way, Hotel Skirvin, Oklahoma City.

25-30 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

26-27 Michigan Gas Association, annual meeting, Grand Hotel, Mackinac Island, Mich.

26-July 7 Massachusetts Institute of Technology, summer program on dynamics and control of chemical engineering processes, Cambridge, Mass.

28-30 International Gas Conference, Stockholm, Sweden.

28-30 Instrument Society of America, American Institute of Chemical Engineers, American Institute of Electrical Engineers, American Society of Mechanical Engineers, and Institute of Radio Engineers, joint automatic control conference, Boulder, Colo.

30 Southern Gas Association, roundtable conference on pipeline operations and maintenance, Dinkler-Tutwiler Hotel, Birmingham, Ala.

JULY

4-7 National Society of Professional Engineers, twenty-seventh annual meeting, Olympic Hotel, Seattle.

6-8 International Oil Scouts Association, annual meeting, Roosevelt Hotel, New Orleans.

10-21 University of Michigan, summer course on underground storage of natural gas, Ann Arbor, Mich.

23-28 National Congress of Petroleum Retailers, annual session, Cosmopolitan Hotel, Denver.

26-28 American Petroleum Institute, Division of Production, eastern district meeting, The Greenbrier, White Sulphur Springs, W. Va.

27-29 Rocky Mountain Mineral Law Foundation, seventh annual institute, University of New Mexico, Albuquerque.

AUGUST

2-4 Wyoming Geological Association, sixteenth annual field conference, Green River, Wind River, and Powder River basins.

20-24 Asphalt Institute, international conference on structural design of asphalt pavements, University of Michigan, Ann Arbor.

28-30 Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

28-Sept. 1 American Society of Mechanical Engineers, international heat transfer conference, Boulder, Colo.

SEPTEMBER

5-8 American Chemical Society, Chicago section, eleventh national chemical exposition, International Amphitheatre, Chicago.

7-8 Rocky Mountain Association of Geologists, field conference, Salida, Monarch, Ouray, Silverton, and Durango, Colo., areas.

7-9 Magic Plains Oil Exposition, Borger, Tex.

11-15 Instrument Society of America, fall instrument - automation conference and exhibit and sixteenth annual meeting, Biltmore Hotel and Memorial Sports Arena, Los Angeles.

12-13 American Gas Association, Southern Gas Association, annual accident prevention conference, Statler Hilton Hotel, Dallas.

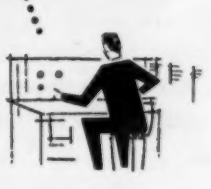
13-15 Pacific Coast Gas Association, convention and annual meeting, Coronado Hotel, Coronado, Calif.

13-15 Mid-Continent Oil and Gas Associa-

streamlined production

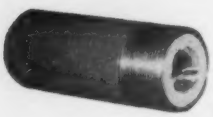
CUTS COSTS . . . IMPROVES PRODUCT AT ENARDO

Enardo, the company who pioneered a whole new concept in lease storage equipment, has again taken a major stride forward by instituting a totally new program of engineering and management services plus complete revitalization of production facilities. Because of these streamlined methods, Enardo Thief Hatches, Vent Valves, Burner Assemblies and other items in a complete line of oil field accessories have been lowered in price, yet maintain their unsurpassed quality. Another innovation at Enardo is the improved inventory control system. Upon receipt of an order, the item is located, packed and on its way to the customer within minutes! All this adds up to greater savings, better products and speedier deliveries when you specify Enardo equipment for your lease. Call, write or wire Enardo Manufacturing Co. for further information.

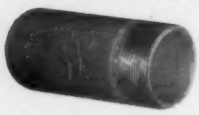


ENARDO manufacturing co.
BOX 1647 • TULSA, OKLAHOMA

production and maintenance problems solved with Inhibited Acid



BEFORE CLEANING



AFTER CLEANING

Dowell inhibited hydrochloric acid is an efficient, economical solvent and cleaning solution. It is low in cost when its cleaning capacity is considered. One hundred gallons of 15 per cent hydrochloric acid will dissolve up to 184 pounds (one cubic foot) of pure limestone or calcium carbonate. It is ideally-suited to do-it-yourself operations.

Dowell hydrochloric acid has many uses. Some of them are: to improve production from old dolomitic or limestone wells; to remove scale and "gyp" from the face of producing formations, tubing and lead lines; to clean disposal or input wells; and to descale engine cooling systems, heat exchangers, boilers, valves, fittings, nipples, etc.

Dowell inhibited hydrochloric acid is available in small or large quantities from any Dowell station. Ask a Dowell representative for application information.

PRODUCTS FOR THE OIL INDUSTRY

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

tion, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

13-15 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

14 Natural Gasoline Association of America, Rocky Mountain regional meeting, Northern Hotel, Billings, Mont.

15-16 Kansas Geological Society, annual field conference, Mark Twain Hotel, Hannibal, Mo.

17-20 American Institute of Electrical Engineers, annual electrical conference of the petroleum industry, Jung Hotel, New Orleans.

18-19 Independent Natural Gas Association of America, annual meeting, Shamrock Hilton Hotel, Houston.

20-21 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

20-21 American Institute of Electrical Engineers, Institute of Radio Engineers, Instrument Society of America, industrial electronics symposium, Bradford Hotel, Boston.

24-27 American Institute of Chemical Engineers, national meeting, Lake Placid Club, Lake Placid, N. Y.

24-27 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Muehlebach Hotel, Kansas City.

25-27 Texas Mid-Continent Oil and Gas Association, annual meeting, Texas Hotel, Fort Worth.

25-28 American Welding Society, fall meeting, Adolphus Hotel, Dallas.

OCTOBER

1-4 American Gas Association, annual convention, Dallas.

3-4 University of Kansas, ninth annual gas measurement institute, National Guard Armory, Liberal, Kans.

4-6 American Association of Oilwell Drilling Contractors, annual meeting, Rice Hotel, Houston.

4-6 American Society of Mechanical Engineers, process-industries conference, Shamrock-Hilton Hotel, Houston.

8-11 Society of Petroleum Engineers of AIME, annual fall meeting, Memorial Auditorium, Dallas.

11-12 Western Petroleum Refiners Association, waste disposal and stream pollution conference, Hotel Lassen, Wichita.

12-13 California Natural Gasoline Association, annual fall meeting, Lafayette Hotel, Long Beach, Calif.

15-17 National Association of Oil Equipment Jobbers, annual convention and trade show, Mayflower Hotel, Washington.

15-18 American Petroleum Credit Association, annual conference, Shamrock-Hilton Hotel, Houston.

17-19 American Society of Mechanical Engineers, American Society of Lubricating Engineers, lubrication conference, Morrison Hotel, Chicago.

18-20 Rocky Mountain Oil and Gas Association, annual convention, Denver-Hilton Hotel, Denver.

18-21 American Association of Petroleum Geologists, Mid-Continent regional meeting, Amarillo, Tex.

24-25 Pennsylvania Grade Crude Oil Association and Pennsylvania State University Mineral Industries Experiment Station, technical conference on oil recovery by solvents, Pennsylvania State University campus, University Park.

J. K. LASSER Tax Institute Shows Extraordinary Returns from OIL & GAS

USE THIS MANUAL FOR 2 WEEKS WITHOUT COST!

NEW YORK, N. Y. —A costly research project into the fabulous field of oil and gas investments has just been completed by the J. K. Lasser Tax Institute. Their findings are of urgent importance now to individuals who seek extraordinary capital growth and high income from relatively small investments—*in addition to tax advantages of a truly unique nature.*

Until now there has been no single source of accurate and unbiased information on this enormously rich area of investment. That is why investors should not fail to see a free examination copy of this extraordinary new guide.

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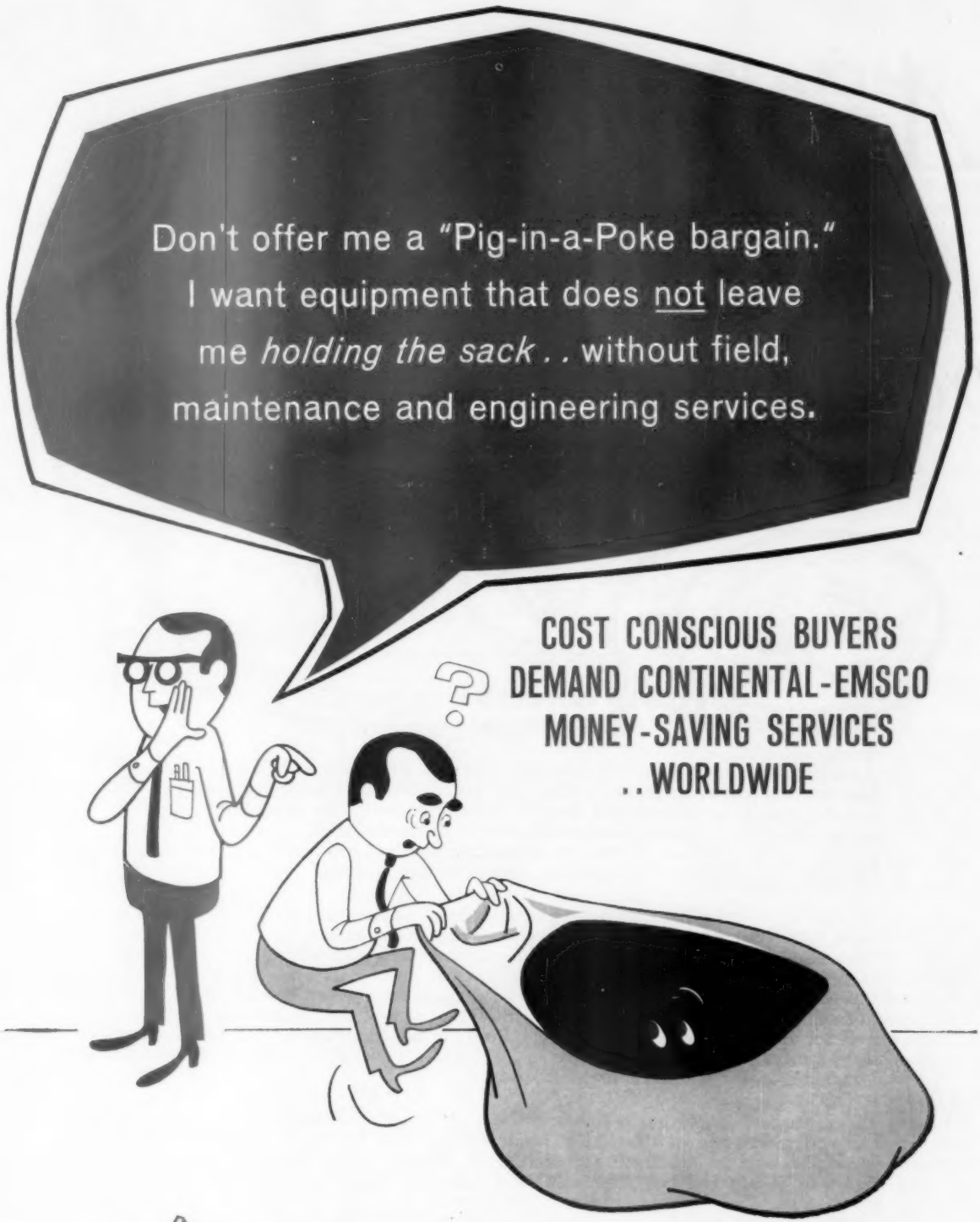
Don't offer me a "Pig-in-a-Poke bargain."
I want equipment that does not leave
me *holding the sack* . . without field,
maintenance and engineering services.
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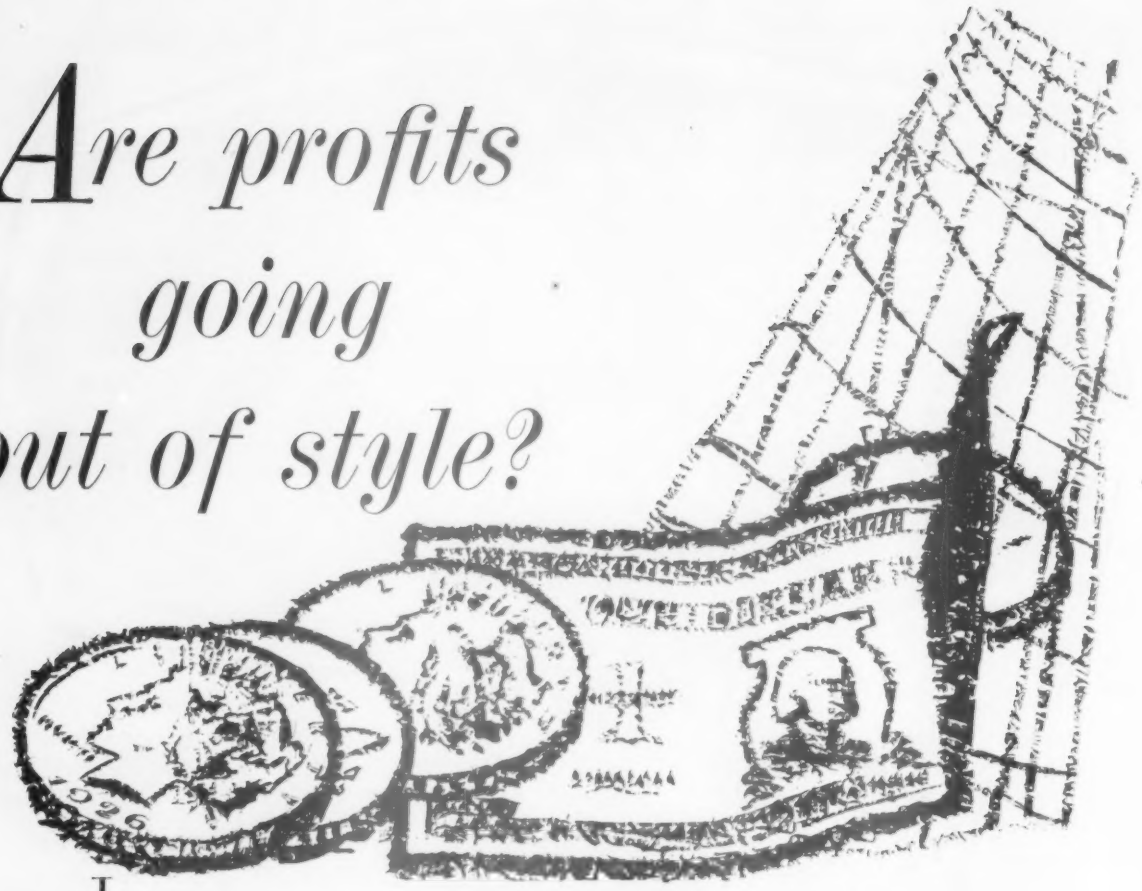
Are profits going out of style?



In a competitive economy the customer is always king, because in such an economy he has a free choice of product. Competition for the king's favor frequently results in a rat race to give more and more for less and less. This eventually results in operations without profit—business suicide. Business, unlike government, cannot go back to the customer and tax him to make up a deficit. Business cannot delude the customer into thinking he is getting something for nothing.

To stay alive—to make a profit—in today's fierce competition a successful business must figure out how to make and sell more products at less cost and still serve customers better. Oil companies have been integrating and streamlining operations as a part of their over-all effort to continue to make a profit. Baroid has done the same thing in unifying their operations. Such steps, when properly done, result in more efficiency and a reprieve from the threat of profitless operations. Continued attacks upon the profit system could result in abandonment of the research and development programs that give us tomorrow's benefits, and abandonment, by default, of the free enterprise system.

We are all buyers just as we are sellers and if we try to get too much for too little we may suffer the fate of the farmer who tried to feed his cows colored sawdust—about the time he got them accustomed to the diet, they died . . . If you like your way of life and the tried and true American System—*never let profit go out of style!*

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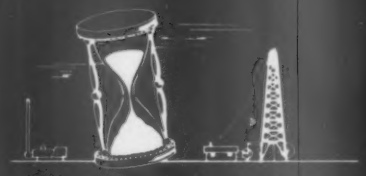

50 years ago

June 22, 1911

From Mexico we hear that concessions obtained by foreigners during the Diaz regime will be an object of special attack under the new government. The new governor of Chihuahua has already announced that foreign concessions regarded as monopolies will not be renewed or extended. Undoubtedly foreigners, including Americans, who profited so greatly under the Diaz system, according to the governor, will be hard hit by the new era.

Petroleum operations in China come under the supervision of the Board of Commerce and some of the restrictions imposed would put our Interior Department officials to shame. As a starter, the government collects a tax of 7½% on the gross output. At present, the proceeds from the tax, paid in Chinese coin, would not burden a 10-year old boy.

25 years ago

June 18 1936

Siberia is reported buying high-test gasoline from California, Black Sea, and Persian Gulf ports.

Chemical Foundation head predicts alky-gas will displace gasoline in 25 years. By that time prediction will be forgotten.

In keeping with the marked improvement in every type of machine used in the drilling for and production of oil, the modern oil-field camp now compares favorably with any town or city both as to housing facilities and recreational and educational features. These changes have slowly evolved from the old rag-and-shack towns so commonly known to the oil-field booms of old.

10 years ago

June 21, 1951

West Texas drilling activity along the Spraberry sand "fairway" is assuming major proportions. This trend follows a north-south direction more than 100 miles across four counties and is over 200 miles wide at its broadest point. 176 rigs are drilling, 100 more locations have been staked.

An old idea in rotary drilling—using air instead of mud—is being revived here in an attempt to find a method of completing wells in the Spraberry sand without contaminating the formation. Tests of air drilling are being conducted at a Carl B. King Drilling Co. rig in southeast Martin County, Texas. This is purely experimental, and it is too early to reach conclusions as to the effectiveness of the method. Hole has been made successfully, however.

JOURNALLY SPEAKING

End-Use Control

WHAT the oil industry needs is end-use control.

Now scrape yourself off the ceiling and get your blood pressure down to where you can read a little further.

We haven't sold out to the coal interests. We know that coal's specialized use of the term has made "end-use control" a dirty word. We are not — repeat, not — advocating that the Government tell every consumer what fuel he may or may not use.

Nevertheless, we say that what the oil industry needs is end-use control. What we mean is that more than a few producers, refiners, and marketers ought to be aware of what uses their output ends up in, and ought to exercise a little more control over it.

Because they don't take the trouble to find out what happens to their product after they sell it, they are often competing with themselves, undermining their own markets, and disrupting the whole industry. Much of this could be avoided by voluntary end-use control.

Example: A refiner reduces his unit costs by running at near capacity. He sells his surplus gasoline on the spot market (perhaps at just a shade under his regular price) and that's the last he thinks about it. But this same gasoline ends up in the hands of a price-cutting retailer who has himself a swell price war and brings down all prices over a wide area. Then this refiner wonders how price wars start.

Example: A lot of producers (including integrated companies that have refineries) are drilling for gas like crazy because they can get a faster payout from a gas well than an oil well these days. This gas goes back east and ends up under a furnace that used to burn oil. Then the producers wonder what happened to the demand for oil.

Example: Producers try to produce all they can and don't know or care what happens to their crude after the pipeline takes it from the lease tank. But surplus crude piles up in costly refinery storage, or crowds other crude into already saturated markets, or is refined into unneeded products which are dumped at distress prices—all of which reduces the refiner's margin and gives him the idea that crude isn't worth much. Then the producers wonder why the price of crude is so low.

Example: In some states where crude is heavily prorated but gas condensate isn't regulated, production of lease condensate is zooming. It sells for less than crude so refiners are snapping it up and have learned how to refine it profitably, so they're substituting it for crude. Producers wonder why crude allowables keep going down.

Example: Canada desperately wants to sell more crude to the U. S. But Canada is also sending tremendous quantities of natural gas south of the border where it displaces oil fuels that might have been made from Canadian crude. Canadian producers wonder why the U. S. can't use more of their crude.

We could go on, but do you get the point?

You could probably supply more examples yourself. How much do you know about the end use of your own product? What happens to it after it leaves your hands? Does somebody else use it in a way that hurts you? Is there any way you could control the end use?

We reiterate: We don't like the idea of Uncle Sam getting into the act and telling you that you can't sell to certain customers or that certain customers can't buy from you.

But short of that, producers, refiners, and marketers might try to exert a certain degree of influence over the end use of what they sell. At least they should have some curiosity about what happens to it.

—Henry D. Ralph

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Big Brother is watching you

THERE ARE highly disturbing aspects to the consent decree merging Standard of Kentucky with Standard of California.

The prohibition against buying any product from Jersey Standard may or may not be proper corrective and punitive action for an allegedly illegal supply contract. But the decree goes much further. It rearranges the pattern of oil marketing in one-fourth of the nation.

In this the Government is engaging in economic planning. It is dictating the future pattern of the industry by paternalistic ukase.

THE PRESUMED OBJECTIVE is to preserve independents and the competition they bring to the market. Yet the nation's largest independent marketer is eliminated and a new major substituted.

This is inconsistent with the Government's previous refusal to permit much smaller oil mergers of a similar nature, thus raising the suggestion that it compromised its policy in order to get its foot in the door of managing the industry's internal operations.

The decree requires that 40% of supplies be obtained from "independent" refiners. But these are defined by size alone, without reference to their degree of integration, methods of operation, or place in the industry's structure. Thus 20 refiners who had nothing to do with the case are arbitrarily excluded from this business.

Furthermore, the decree extends beyond the five states where Kentucky marketed and imposes restrictions on any business Socal may in the future develop in six additional states where neither has ever marketed.

It seems clear that the Government has used its position of power to force on the industry its own idea of how the oil business should be organized and operated.

Who can foretell whether these and other puzzling aspects of the decree will help or hurt independents, free or freeze competition, in the long run?

The point is that nobody can foretell such, and that the Government is arrogating omniscient powers to itself in essaying to rearrange the industry and allocate supply sources.

AN ANONYMOUS COTERIE of social planners has undertaken to Big Brother the oil industry by decreeing what it thinks is "good for" its members and its customers.

Any charged infraction of the antitrust laws may be used to remold the structure of the industry—including operations of those not charged with infraction—to suit the whims of Big Brother.

Thus a simple law enacted two generations ago to keep competition free from the machinations of Big Business is contorted into an instrument whereby Big Government channels competition and moves oil companies around the economic map like pawns on a chessboard.

Get your pipe stringing investment out of the mud

Nothing bogs down men and machines on a pipe stringing job like old man mud . . . especially when heavy equipment churns the stuff into a thick batter. To side-step the mud and leave a workable right of way for the pipe gang, a Sikorsky helicopter was used by Petroleum Helicopters, Inc. to string some of the pipe for the Trunkline Gas Company in Texas. Not only were the crews able to work more easily and faster because they were not hampered by as much mud, but the helicopter also made it possible to complete the job days ahead of schedule at the substantial saving of about 30 cents a foot. Why not put your investment where it won't get slowed down, where it can move ahead and produce faster results for you. Find out the interesting facts about using or owning a Sikorsky helicopter. It can cut the time and cost of stringing pipe, of setting river weights in swampy areas, and of other lifting and trucking operations. Write today for all details.

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Oil Faces a Shortage of Technical Talent

• Recruiters may have done all right this year, but a look at enrollment in engineering shows problems ahead. Say the educators: There's been so much scare talk that students think the oil industry is a dying business.

FRESHMEN and sophomores in the nation's colleges think the petroleum industry is dying on the vine.

They're staying away from petroleum engineering in large numbers. They're looking at the electronics, missiles, and other glamorous industries where they figure there's greater growth potential.

It's true that oil-company recruiters had few troubles in signing up new recruits this year. But unless a strong trend away from petroleum changes sharply, oil's management is in for big trouble in the years ahead.

The coming shortage—some call it a crisis—was spotted in a Journal survey among company recruiters and engineering educators following the harvest of 1961 graduates. Here's the situation:

. . . **Recruiters** for integrated companies generally filled their needs this year for engineering graduates. There was a noticeable shortage of quality students, however. The drilling and service branches on the other hand were almost shut out.

. . . **Number** of petroleum engineering graduates was off. Demand for quality graduates exceeded supply, forcing oil company recruiters to look for manpower among mechanical, chemical, and electrical engineers. Here they met stiff competition from other industries which offered more glamor and starting pay.

. . . **Enrollment** in all engineering sciences is down. This will complicate oil industry recruiting in years ahead because changing needs call more than ever for a variety of engineering talents.

. . . **Educators say** the industry must help interest bright high school students in petroleum careers, provide scholarships, give summer jobs to undergraduates, improve their engineering employment practices, and quit singing the blues so loudly.

Image important . . . The general opinion among recruiters and educators alike is that economy programs, layoffs of technical personnel, and the recent recession in the oil industry have dimmed the luster of oil-company employment.

This is particularly true in the oil country where the industry once was very attractive to students. Word of the stringent employment practices of a few companies gets back quickly to the colleges and chills the ardor of many boys for oil-company work. Just as important, the parents are influenced by what they read about the oil industry and steer their sons into other fields.

This trend reaches back to the high school level and affects the brighter, more energetic students. They aren't attracted to petroleum engineering. If they go into engineering, they study chemical, electrical, or mechanical. But more likely, they will turn to the sciences—mathematics and physics—highly touted as the disciplines in demand by the glamor industries.

The pay also seems to follow the glamor—it's part of the image. Recruiters for several top oil companies report they have lost good prospects this year because they were outbid on pay. Starting pay for engineers going into aircraft, space, or nuclear industries reportedly is from $24 to $40 more a month than for oil.

The job market . . . Recruiters are worried more about technical manpower prospects over the next few years than about immediate needs.

They rate the current market an employer's market. None of them are hurting even if they didn't fill all their quotas. They report the real shortage now is in top-grade graduates. If recruiting standards were lowered, there would be no trouble at all.

Among the various engineering specialties, they gave this rundown:

. . . **Petroleum engineers** are adequate now—it's a matter of picking and choosing.

. . . **Electrical engineers** are scarce because of the current heavy competition among industries for their services.

. . . **Mechanical and chemical** engineers also are harder to attract.

One recruiter described the market like this: "Oil companies right now may be hunting for quality engineers—the kind we have been able to get in other years. There are plenty of students, but you have to battle for the good ones you want."

The oil industry's needs for technical manpower also are shifting.

The companies are expanding their processing in natural-gasoline and petrochemicals as well as refining. Thus they need more chemical engineers. Automation, instrumentation, corrosion work, electronics, etc., have stepped up the need for electrical engineers.

Even in production—where petroleum engineers dominate—the emphasis on the geology of reservoirs is diminishing in favor of finding more economic ways to produce the crude. This means mechanical engineers often fit into the picture nicely.

In fact, more and more companies want men with good basic engineering background who after

What Educators Say About Enrollment

"THERE ARE two main reasons for declining interest in petroleum engineering: Emphasis on the more exotic fields such as space exploration, and the tougher requirements of the engineering curriculum.

"Also there is too much publicity implying that atomic energy will supplant hydrocarbons as a fuel. The most influential advisers to students are parents—and they read the headlines."

—C. V. Kirkpatrick. University of Houston.

"THERE IS considerable misinformation among young students on just what engineering is. They go into sciences when actually what they really want is engineering.

"Engineering is selling itself short. Engineers had more to do with missiles than scientists but most of the time the publicity is for the research scientists instead of the research engineers."

—Dr. A. J. Chapman, Rice University.

"OVEREMPHASIS appears in periodicals and newspapers and even in advertising by the oil and chemical industry on accomplishments of the scientist, when in many cases these accomplishments were really made by engineers.

"It would appear to the high-school senior or college freshman about to make a choice of field that the glamorous life must be found in the sciences rather than engineering."

—Thomas W. Harrington, Jr., Massachusetts Institute of Technology.

"I SINCERELY believe that one of the reasons for the oil industry's difficulty in attracting graduates has been that for the past few years companies have hired very few people, with the result that the student feels that the opportunity may not be present."

—Chester E. Peters, Kansas State University.

a year's orientation and training can handle a variety of assignments.

This trend in itself poses a recruiting problem. In recruiting the petroleum engineer, selling him on the industry isn't necessary. He's already committed to a career in oil somewhere. But in talking to the students in the other engineering specialties, the recruiter often has to make the oil industry attractive to them before he can give the attractions of his own company.

Here again the industry's image plays a role.

The enrollment plunge . . . The industry even may be losing its supply of petroleum engineers with their presold loyalty.

The decline in petroleum engineering enrollment has been alarming in the last 3 years, leading to talk that the subject may be dropped from the curriculum of several schools.

Statistics from the 27 colleges offering petroleum engineering degrees tell the story: In the fall of 1957, total enrollment for these courses was 4,803. It dropped steadily—to 3,454 in 1958, 2,331 in 1959, and 1,786 in the fall of 1960.

This year's senior classes in petroleum engineering across the country totaled 589, down from 891 only 2 years ago. The outlook isn't any better because this year's sophomore class numbers only 256.

One of the few bright spots is post-graduate work. Enrollments here have held steady, even booming at some schools. There were 213 students doing petroleum engineering post-graduate work this year compared with 222 in 1958. Experience shows that most of those who take master's degrees go into production while those who go for doctorates usually turn to research.

Some recruiters and a few educators say privately they fear that petroleum engineering schools may disappear except at a few larger universities.

Even the larger schools are having problems. The University of Texas has only 27 junior petroleum engineering students and 12 sophomores. University of Oklahoma will have 35 students in next year's graduating class, 30 less than this year. Texas A & M will have 18 seniors. In past years, these three schools have been the enrollment leaders in the field.

Declines also have been experienced in other regions. Enrollment at Pennsylvania State University dropped from 92 in 1958 to 68 at the start of the 1960-61 academic

What Industry Offered the 1961 Graduate

	Number offers	Salary		
		Average	High	Low
Chemical Engineers				
Petroleum	128	$546	$610	$450
Aircraft	33	550	575	520
Chemical, drugs, allied	289	537	630	465
Electronics, instruments	10	559	641	500
Mechanical Engineers				
Petroleum	70	544	700	445
Aircraft	371	548	733	444
Chemical, drugs, allied	144	544	800	465
Electronics, instruments	103	543	630	444
Electrical Engineers				
Petroleum	36	540	600	450
Aircraft	584	561	771	444
Chemical, drugs, allied	58	550	650	490
Electronics, instruments	530	560	685	425
Average all curricula				
Petroleum	333	534	...	...
Aircraft	1,342	470	...	...
Chemical, drugs, allied	644	532	...	...
Electronics, instruments	741	553	...	...

Source: College Placement Council, based on 5,364 offers received from 61 colleges and universities up to March 17, 1961.

"I HAVE noted in the past 2 or 3 years that it has been rather difficult for undergraduates to find employment during the summer.

"I believe that this factor has somewhat curtailed the interest in those who might have had some notion of being petroleum engineers."

—Leon Hershkowitz, School of Mines and Metallurgy, Rolla, Mo.

"A FEW larger scholarships rather than many smaller ones might help the oil industry in its recruiting program. The larger scholarships receive much more publicity among the students."

—Pauline V. Chapman, University of Illinois.

year. The total number of students in the sophomore and junior petroleum engineering course at Stanford was only 4 this year compared to 10 or 11 in years past. Colorado School of Mines graduated 21 petroleum engineers this year compared with 30 in 1957.

Dr. Carl Gatlin, head of Texas petroleum engineering department, said his department has gone from the largest to the smallest at the school in just 4 years.

Robert L. Whiting, head of Texas A & M's petroleum engineering department predicted that more than half of the present petroleum engineering schools will be closed soon unless additional support is forthcoming from the oil industry.

"By support," Whiting added, "I mean unqualified statements from the petroleum industry that there is a need for students with petroleum engineering training."

A dilemma . . . There's a feeling in some quarters of the industry that the changing technical requirements have lowered the once big demand for petroleum engineers.

Some company executives look with favor on curriculum moves such as that at Texas where a general engineering science degree is offered or at several other colleges where a petroleum option is offered to the mechanical engineering course.

If the petroleum specialization is dropped, however, many recruiters report that company training programs will have to be expanded.

Dr. John Campbell, head of Oklahoma's petroleum engineering department, estimated that there should be a steady demand in the industry from 300 to 400 graduating petroleum engineers yearly. He said the specialized instruction should be kept.

Oklahoma offers a hard core of more than 100 hours of general engineering study to its petroleum engineering students with only about 35 hours or so of work in the petroleum specialty.

Dr. Campbell said the real fight now is to get quality students. He warned if the industry fails in this it will only have mediocre talent to pick from in the years ahead.

The Oklahoma professor has started a campaign to discuss the advantages of a career in oil before small groups of the brighter high school students in Oklahoma.

Texas University has prepared a brochure and mailed it to high schools aimed at revitalizing interest in oil careers. Dr. Gatlin also holds frequent "bull sessions" with freshmen engineering students in other fields, trying to counteract their feeling that oil is not attractive. An AIME committee under chairmanship of Texas A & M's Whiting has started a program cooperating with local oil information committees to glamorize oil careers at the high school level.

Most oil men and educators close to the problem feel it boils down to this: The general poor image for the oil industry is responsible for 75 to 80% of the trouble with salary responsible for the rest. The big job is a public relations one of convincing young people there's a future in oil.

New Attack Aimed at Depletion

• Williams proposes a three-step reduction to 20%, tied to tax cuts for high incomes to make it more attractive.

SEN. John J. Williams, (R.-Del.), is making his annual attack on oil's percentage depletion provision.

This time he is proposing a graduated, three-step reduction to 20% in 3 years.

Under the terms of his proposal (S. 2069), the first reduction—from 27½ to 25%—would be made January 1, 1962.

In the second year, it would drop to 22½%.

The third year, it would be reduced to 20%.

To give his proposal more sales appeal, Williams is coupling with it a proposed three-step reduction in the top bracket of individual income taxes from the present 87% maximum to a 60% maximum in 3 years.

The way Williams figures it, the Government would gain $250 million annually from oil producers while losing $130 million by the reduction in the individual income tax change—a net gain of $120 million.

Because all revenue bills must originate in the House, Williams said his new bill will be added to "some" revenue-producing bill sent to the Senate from the House.

He said it would not be either the federal aid highway bill or the bill to extend excise and corporate taxes.

Williams had told the Journal last February that he would not attempt to tack a rate-cutting rider on House-passed legislation unless he felt there was a fair chance of succeeding (OGJ, Feb. 6, p. 78).

The fact that he is bypassing an opportunity to make the attempt in connection with the highway bill or the corporate tax extension would indicate that he does not yet feel he can rally sufficient strength.

Williams said on the Senate floor last week that he considers the oil industry one of the important segments of the American free enterprise system, but that the 27½% rate is too high.

"This rate was established at a time when our maximum corporate rates and the maximum indivdual income tax rates were both well below 20% and at a time when the cost of operating our Government was only about 3% of what it is today," he said.

At the Fuels-Study Hearing

Even Coal Disclaims End-Use Controls

IF TESTIMONY at a hearing has any impact, any Senate committee set up to study the nation's fuel resources will be instructed to avoid end-use control of any fuel for any region of the country.

Witness after witness at a hearing last week told the Senate Interior Committee that a fuels study should not be used as a starting point for dictating to consumers what fuel they must use.

Even the coal-industry spokesmen—the strongest advocates of a fuels study—vowed that allocation of fuels was not the purpose behind the resolution (S. Res. 105) calling for the study.

They continued to insist this was so under questioning by some skeptical senators who wanted to know if help for the ailing coal industry wasn't really what all the shouting over a fuels study was about.

Sen. John Pastore (D.-R. I.), who testified before the committee, was bluntest of all in declaring that end-use control of fuels would be a mistake.

He said the consumers in New England were not going back to shoveling coal, and he attacked existing federal restrictions on the importation of residual fuel oil.

Pastore—one of the 62 signers of the study resolution—said that while he favored the study, he did not want it to be aimed at helping any one industry or any particular region.

Texas Gov. Price Daniel, in a statement read by Rep. Frank Ikard (D.-Tex.), warned that a policy which attempts to allocate markets or impose end-use control "would seriously damage the state oil-and-gas conservation programs."

Daniel said that from the standpoint of conservation and for the best interests of consumers and producers alike, the most beneficial national fuels policy should be one of free and open competition among the principal sources of energy.

The Independent Natural Gas Association of America recalled the end-use overtones in earlier proposals, and said it would support a study only if it were entirely objective.

A spokesman for the Independent Petroleum Association of America said his group has traditionally opposed end-use control and will continue to do so.

Davis criticizes . . . Morgan J. Davis, president of Humble Oil & Refining Co., questioned the need for any special study at this time.

Davis, speaking for the American Petroleum Institute and two oil and gas associations, pointed out that the United States has an abundant supply of domestic energy.

He said current estimates of proved reserves represent only a fraction of the oil and gas that can be supplied in the future, provided operators are not discouraged from the development of existing and new resources by burdensome regulations and tax provisions.

He said the achievements in all fields of energy have been realized "without any coordinated fuels policy in the sense of a vast plan by government."

Instead, he emphasized, the approach has been to rely on competition to the maximum extent possible and to impose regulations only where competition did not serve the public interest adequately.

Davis conceded that problems have cropped up from time to time concerning various energy resources. In such cases, however, these problems should be studied directly by an appropriate committee in Congress.

"It does not seem to me that the type of study proposed by Senate Resolution 105 would be appropriate to deal with such special problems," he said.

Davis also warned that the broad study proposed "is apt to bog down in a mass of detail."

Furthermore, he said, the implication of a coordinated national fuels policy is undesirable because it suggests some form of governmental planning based on "questionable hypotheses" about what may happen at some time in the future.

Davis and others noted that a great deal of information is already available from past studies relating to fuels, such as the report by the Paley commission. Also, Davis said, the Government can draw on special groups that already exist—such as the National Petroleum Council — to provide it with any needed data.

He urged that if the Senate should decide to go ahead with a study, it ought to be handled by the Interior committee itself rather than by a specially appointed one.

In spite of their obvious reluctance to see Congress launch a special, broad-scale study, Davis and some other oil-industry spokesmen assured the committee they would cooperate in any study that is undertaken.

Softer tone . . . Alvin C. Hope, IPAA's president, did not go nearly as far as Davis in questioning the need for a study.

In fact, Hope indicated that even though IPAA had not advocated a fuels study, he felt the industry might benefit from one.

He pointed out that producers themselves have some serious problems and that a congressional study might develop better understanding of them. He cited natural-gas regulation as an example.

"The need for appropriate legis-

Provisions of S. Res. 105

UNDER the resolution calling for a fuels study, a special Senate committee would be named by the president of the Senate.

He would be required to appoint Democrats and Republicans in proportion to the percentage each party has in the upper chamber.

The committee would be given $200,000 a year. It would report by early 1963.

lative action to correct this problem is imperative if consumers of natural gas are to be assured an adequate supply of this essential fuel," he said.

Like Davis, Hope contended that this nation will continue to have ample energy supplies unless too many obstacles are placed in the path of development and utilization.

John Partridge, president of the Columbia Gas System, Inc., declared that "no one can come before this committee today and charge that the American people have not been supplied with an abundance of fuels to perform the needs of our society."

Furthermore, he said, there is no imminent shortage of fuels to meet future requirements.

Partridge charged that the coal industry still hopes to get the Government to set aside certain markets for it.

Tenneco awards contracts for petrochem center

TENNECO Chemical Co., a Tennessee Gas Transmission Co. subsidiary, has awarded construction contracts for most of a new petrochemical complex on its 794-acre Houston Ship Channel property.

M. W. Kellogg Co. has the contract for a 100-million-lb.-yearly acetylene plant. The plant will use a process developed by Societe Belge de l'Azote of Belgium.

Bechtel Corp. will build the offsite facilities.

Hydrocarbon Research, Inc., will supply oxygen for the acetylene plant. Oxygen will be produced from a hydrocarbon research plant constructed on the Tenneco property.

Contracts for four additional units of the complex will be awarded later. These plants will make about 100 million pounds of vinyl chloride monomer and undisclosed amounts of vinyl acetate monomer, ammonia, and methanol.

The acetylene plant will be a key unit in the complex. Production will be by partial oxidation of methane with oxygen as the oxidizer. Reactor effluent will move into a recovery section which will produce high-purity acetylene.

Watching WASHINGTON

Clyde La Motte

• Harris bill at least provides a starting point . . .

FIRST REACTION in these parts to new natural gas legislation introduced by Rep. Oren Harris (D.-Ark.) was that it at least provides a starting point.

No one has jumped on the bandwagon with immediate, wholehearted support for Harris' latest bill (H.R. 7575), but neither has anyone dismissed it lightly.

This cautious reaction stems from the fact that while almost everyone finds something he likes in the bill, there are also provisions he dislikes.

As a result, each group affected has hopes that the provisions it finds appealing will be retained in final legislation and that provisions it finds objectionable will be eliminated.

At any rate, most feel that Harris has at least made an effort to deal with all major aspects of the gas regulatory problem rather than approach it piecemeal as other legislation introduced thus far this year has done.

The real showdown will come when hearings are held so that all sides will have an opportunity to state their case and to suggest amendments.

• Who will take the lead in pushing new legislation? . . .

QUESTION at the moment is what group, if any, will take the lead in giving gas legislation a push.

Producers are not likely to take on this role. For one thing, there are parts of the bill they don't like, such as the elimination of all but fixed escalation clauses.

Some are concerned that costs would still be considered by the Federal Power Commission, even though Harris' bill does rule out the strict utility-type regulation of producers.

About as far as most producers will go at this point is to concede that the new bill has some of the basic principles which producers have felt were prequisite in remedial legislation.

As Dan Jones, IPAA's counsel, put it: "It is hoped that this new proposal will provide a vehicle which will make it possible for Congress to correct the increasingly impossible situation."

Most of all, producers certainly don't want Congress or the public to get the idea that H.R. 7575 is a "producer" bill—which it definitely is not.

• Key factor may be action by distributing companies . . .

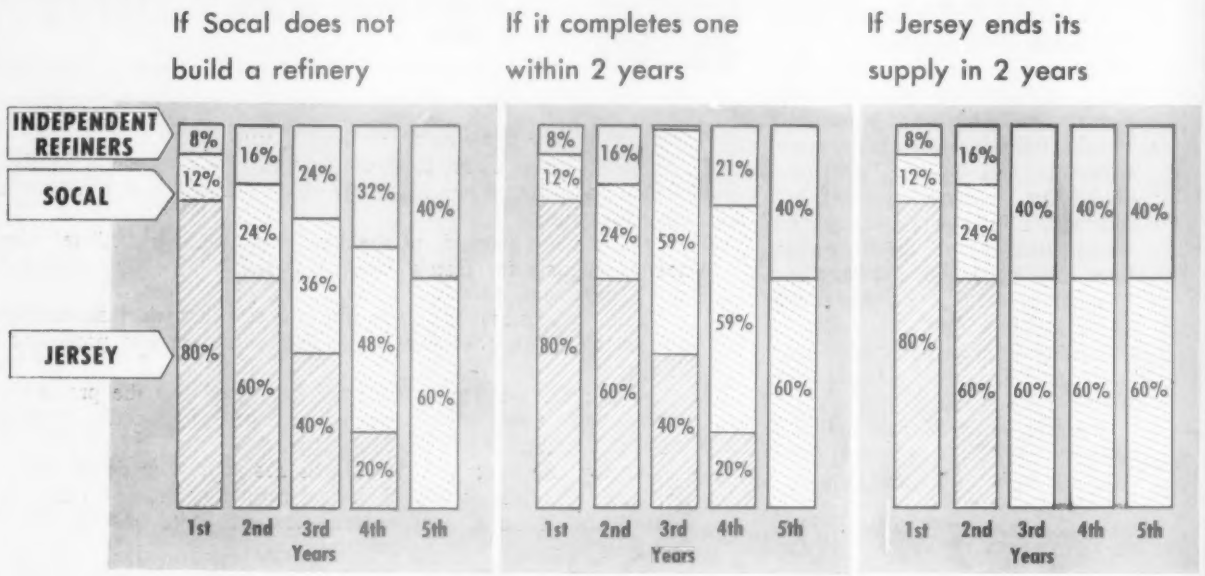
IF PRODUCERS are reluctant to move out front to support the new gas bill, interstate pipeline companies are even less likely to do so.

In fact, they are miffed at this point, figuring that almost everyone else gets some "break" in the new Harris bill, but that they get none. Instead, the bill hits them with a provision prohibiting the filing of successive rate hikes when one is still pending at FPC.

This viewing with caution, if not outright opposition, by pipeliners and some producers tends to put the question of vigorous support up to the distributing companies.

Perhaps it would be just as well that way, for the distributors are in a better position to convince Congress and the public that a continuation of the present chaotic situation can only lead to more confusion, more delay, a shorter supply of gas, and higher consumer prices.

Here's how the Kentucky area will be supplied



What the Socal Merger Will Mean to Small

• At the worst, the independents won't share in the market at all for the first 3 years. At best, they could sell Socal 18,600 bbl. daily the first year and double that in the second. It all depends on what Socal does.

THE BIG question along the Gulf Coast last week was this:

How much of Standard of Kentucky's five-state market will be supplied by independent refiners and how soon?

The answer: It's strictly up to Standard Oil of California.

The volume can range from nothing to as much as 56,000 bbl. daily or more in 1964. After that, a sizable outlet is assured.

The near future depends on three things:

. . . **Whether** Socal builds or buys a refinery which can serve the Kentucky marketing area.

. . . **Whether** Socal supplies its own product to the extent it is permitted to, or whether it buys the material from other majors — or from independents.

. . . **Whether** Socal decides to start marketing in six states adjoining the Kentucky five-state area.

What's involved . . . The independent refiners are looking wistfully at 40% or more of a 93,150-bbl. daily market for four major products (based on Standard of Kentucky 1960 sales) in Florida, Georgia, Alabama, Mississippi, and Kentucky.

The consent decree approving the Socal-Kyso merger (OGJ, June 12, p. 81) directs both firms, for the next 15 years, to buy from small refiners "at least 40% of their requirements for automotive gasoline, kerosine, heating oil, and diesel fuel."

But there are qualifications.

Bulk of the market is now supplied by Standard Oil Co. (N. J.). The consent decree says this Jersey-Kyso contract shall be ended according to the contract's terms. And these terms provide for a gradual reduction in Jersey's supply from 80% the first year to nothing in the fifth (first chart).

What's left of the market after Jersey takes its share is to be split by Socal and the independent refiners 60-40.

But if Socal buys or builds a refinery, the picture changes (second chart).

In this case, Socal can provide 60% of the market remaining after Jersey's share or 55,000 bbl. daily, whichever is greater.

Based on 1960 sales, Jersey, with 80% in the first year, would supply about 75,000 bbl. daily. It would supply about 56,000 bbl. daily in the second year and 37,000 in the third.

With Socal privileged to provide 55,000 bbl. on top of Jersey's supply, this would leave nothing for the independents in the first two years and less than 1% of the whole market in the third.

Assuming Socal builds a refinery, to begin operating by 1964, this would mean some market for the independents in the first 2 years, but perhaps none in the third.

However, Socal has said it has no

In the chart:

- Each bar represents 93,150 bbl. daily, Kyso's 1960 average sales of gasoline, kerosine, heating oil, and diesel.

- Yellow segments are the minimum share available to independent refiners.

- The "Socal" segments can be supplied by Socal, either from its own refineries or by purchase from either majors or independents.

- If Socal should buy a refinery, it could wipe out the market for independents, shown in second chart, for first 2 years.

The market and the suppliers

These refiners qualify under the consent decree and could supply the Kyso area

	Calendar-day capacity (bbl.)
Kentucky	
1. Somerset Refinery, Inc., Somerset	1,500
Tennessee	
2. Delta Refining Co., Memphis	19,500
Texas City area	
3. Plymouth Oil Co. (formerly Republic)	42,750
4. Texas City Refining, Inc.	34,000
Houston area	
5. Crown Central Petroleum Corp.	40,000
6. Signal Oil & Gas Co.	63,000
7. Eddy Refining Co.	2,000
Corpus Christi area	
8. Delhi-Taylor Oil Corp.	45,000
9. Howell Refining Co.	4,750
10. Southwestern Oil & Refining Co.	33,000
Other	
11. Delhi-Taylor, Port Isabel	12,000
Louisiana	
12. Ingram Oil & Refining Co., Meraux	19,000
13. Tenneco Oil Co., Chalmette	41,000
On the Okla.-Miss. River Pipeline	
14. Apco Corp., Cyril, Okla.	12,000
15. American Petrofina, Inc., Wichita Falls, Tex.	9,000
16. Cosden Petroleum Corp., Big Spring, Tex.	29,600
17. Col-Tex Refining Co., Colorado City	12,500
On the Texas Eastern Transmission Pipeline	
18. La Gloria Oil & Gas Co., Tyler, Tex.	24,000
19. Atlas Processing Co., Shreveport	17,500
20. Cotton Valley Solvents Co., Cotton Valley, La.	4,750
21. MacMillan Petroleum Corp., Norphlet, Ark.	4,275
22. Lion Oil Co., El Dorado, Ark.	33,600
Indiana	
23. Indiana Farm Bureau, Mount Vernon, Ind.	11,875
24. Jarvis Refining Co., Troy, Ind.	1,500
On the Cherokee Pipeline	
25. Kerr-McGee Oil Industries, Inc., Cushing	21,500
26. Midland Cooperatives, Inc., Cushing	12,190

Refiners

plans now in the works for a refinery. If so, it is highly unlikely it could design and build one in the next 2½ years.

Practical factor . . . The big hope for independents lies in the fact that Standard of Cal probably will have to buy products to meet its 60% share of the market—unless it acquires a refinery.

Its refineries in California, New Jersey, and at El Paso, Tex., are in awkward locations for the Kentucky market.

It does have some options.

Socal is long on crude, so it could pay other refiners to run its crude. For a Gulf Coast independent, this would be an ideal arrangement. He could run this extra crude at little expense.

Socal also could make trade-out arrangements with other refiners.

Or, Socal could buy the products it needs, from either majors or independents.

It could build its own Gulf Coast refinery, or it could buy one. But it is generally considered unlikely that Socal will take on a major refinery until it feels certain it can dispose of all of its output. This would not be a sure thing in the Kentucky area for more than 2 years.

New market area? . . . Another big question for independent refiners—and another big hope—is the six-state area adjoining the Kentucky area.

Standard of Cal does not now market in Arkansas, Louisiana,

Tennessee, North and South Carolina, or West Virginia.

The company isn't talking now about its plans. But the Justice Department apparently feels it eventually will move into these states.

As its price for approving the merger, Justice insisted, and Socal agreed, that Socal buy from independents at least 40% of its product supply to be marketed in the six states.

This could eventually mean a big new outlet for some independents. When and how much are likely to remain questions for some time to come.

What's 15% . . . Another provision in the consent decree is that, while Socal must buy 40% of its supply from independents, not more than 15% can come from any one independent.

The consent decree spells out the fact that the 40% refers to the market left after Jersey's supply is deducted.

The 15% is not spelled out. But Justice Department attorneys last week indicated that this refers to the total market. Based on 1960 sales, this would mean that any one independent refiner could supply as much as 13,970 bbl. daily.

The time element . . . Best bet on when the present marketing arrangements will change is about next January 1, as observers figure it.

The consent decree becomes effective 30 days after the Kyso-Socal merger is effected or Socal acquires Kyso's assets. Socal stockholders will vote on the proposal next month.

Justice Department officials apparently feel that the deal will be completed about the end of the year.

If so, this means that 1962 will be the first year as shown on the charts. Jersey, then, would supply 80% of Kentucky's needs until January 1, 1963, when the phase-out would begin.

Humble Asks for a Fight in Mississippi

A MARKETING and legal showdown is building up fast over rights to the Standard brand name in the southeastern states.

Humble Oil & Refining Co., the Jersey Standard domestic operating subsidiary, made two things plain last week. It will:

. . . **Challenge right** of California Standard to acquire the Esso brand in the area through merger with Kentucky Standard.

. . . **Set up its own marketing** outlets in the Kentucky Standard territory to recover gallonage lost by the court decree setting up the Kentucky-California deal.

Tipoff was Humble's quick move into five Mississippi cities with marketing operations. Stations displaying the Esso—rather than Enco—emblem were opened in Biloxi, Gulfport, Natchez, Greenville, and Jackson.

Injunction proceedings were started in Jackson federal court to precipitate the legal fight over Kentucky's possible transfer of the Standard brand to California.

Jersey Standard and Humble officials declined to comment on any phase of the Humble move or to speculate on what battles lie ahead.

Trade sources, however, agreed that Humble's moves at this stage indicate its first aim is to settle the question of who can use the Standard or Esso brand in marketing over the five-state Kentucky territory.

Humble's marketing operations at the moment are only token affairs but point out the route it will take in fighting for business it will start losing in a year or so. Stations probably will be opened soon in Florida and Georgia. Humble already does limited marketing in Kentucky.

Elk Hills Swap Would Benefit Navy, Socal

STANDARD Oil Co. of California explained to a House committee in Washington last week why it wants to swap its reserves in the deep (Stevens) zone of Elk Hills to the Navy for the latter's holdings in the shallow zone.

The problem, a company spokesman told the congressmen, stems from the fact that the company wants to produce oil now while the Navy is required to hold as much of its reserves as possible for an emergency.

Each faces frustrations because the company's production is limited by restrictions while the Navy has to produce oil it does not want—and sometimes has a hard time selling—just to protect its shallow holdings from drainage.

By making the proposed swap, the company said, each will benefit. The company will be able to produce from the shallow zones while the Navy will have an ideal reservoir in the deep zone which it can keep for emergency purposes since there is no drainage problem involved there.

Specifically, Standard would swap its estimated 112 million barrels of Stevens zone crude for an estimated 84 million barrels of Navy's shallow-zone oil.

The Navy would come out ahead by 28 million barrels. Furthermore, the company said, the value of the deep oil is $4 a barrel compared with $2.30 for shallow-zone crude.

Standard would get 90% of shallow-zone production until 26 million barrels had been produced. Thereafter, Standard and the Navy would share equally from that zone.

Standard also agrees to buy any crude the Navy is unable to sell elsewhere.

The company said frankly that it figures it will come out better in the deal, too, than it would continuing under terms arranged in 1944.

"We are able to make the concessions because they are justified by the economic gains involved," George J. O'Brien, a company vice president, told the committee.

Rep. Harris' Goal: Workable Gas Regulation

• For the second time, Rep. Oren Harris has introduced a natural-gas bill in the House. It's another attempt to clean up FPC's backlog of cases and put regulation on a simpler, more logical basis.

• The bill right now is a trial balloon. There's been limited reaction from the industry. Here, in an interview with Journal Editor Clyde La Motte, Harris explains the provisions and tells why he included them.

Q. Congressman Harris, what prompted you to introduce new natural-gas legislation at this time?

A. Everyone has become increasingly aware that something has to be done because of the pileup of cases at the Federal Power Commission.

It is obvious now that utility-type regulation of producers just won't work. So what I have done is to try to provide a workable type of regulation.

We have already had legislation introduced dealing with one phase or another of the problem, including the President's suggestion for small-producer exemption, the Federal Power Commission's recommendation dealing with multiple filing of rate hikes, another proposed amendment having to do with suspension of industrial rates, and so on.

There is a growing demand for consideration of these proposals. It occurred to me that it would be better to have one bill that would deal with all these problems rather than to go at it on a piecemeal basis.

Q. When do you plan to start committee hearings on your bill?

A. I have no plan for that. It depends on the reaction I get from the White House, from the Federal Power Commission, from various segments of the industry, and from other groups, including consumer-interest spokesmen.

If there is no interest in the bill, then there will be no hearings.

Q. What reaction have you received so far?

A. Not much. I did notice that the coal people didn't lose much time in speaking up with their objections. Of course, the most important reaction will be the one from 1600 Pennsylvania Avenue. I don't know what that reaction will be, although before I introduced the bill I did talk to some of the people down there. And my bill includes the White House proposal that small producers be exempt from direct control.

At this point, I do not have any direct commitments from the administration.

Q. Is the fact that your new bill calls for some producer regulation an admission that you feel a complete decontrol bill would not have a chance of passage?

A. Some form of producer regulation is inevitable, that's a political fact of life. Many producers are coming to the realization that some controls are going to continue.

This is not any of my doing, you know. I fought long and hard for decontrol. What I am doing now is trying to shape up controls the producer can live with, and continue to provide an adequate supply of gas to consumers at reasonable prices.

Q. Regarding specifics of your bill, H.R. 7575, how will producers be affected directly?

A. Well, small producers—those selling 2 billion cubic feet or less annually to interstate pipelines—would be exempt as long as their prices didn't affect the fair market price.

Contracts for the remaining producers would be regulated by the FPC. However, this would not be on a utility cost-of-service basis but under a commodity concept of a fair and reasonable market price.

For old contracts, fixed prices already approved at the time the act would go into effect would be valid. This would apply also to rate increases already in effect that had been brought about by an indefinite pricing clause—provided it had already been approved.

Since the bill prohibits most indefinite pricing clauses, old contracts with such clauses calling for future indefinite price hikes would be invalid. Those contracts would have to be resubmitted to the FPC for approval—with the indefinite pricing clauses removed, of course.

As for new contracts, including those pending before the commission or the courts at the time the act would become effective, there could be none of the outlawed indefinite price provisions.

Definite price step-ups would be permitted, if the commission approved them as being fair market prices.

Once a contract is approved, the FPC would have no further jurisdiction.

Here is the exact language of the bill setting forth the commission's jurisdiction:

"The jurisdiction of the commission with respect to new producer contracts shall be limited—

"1. To determination of whether the definite pricing clause, if any, contained in the contract results in a price of the natural gas at the point of delivery specified in the contract, and if so, the making of a finding determining such reasonable market price,

"2. To determination of whether the contract contains a type of indefinite pricing clause which is made unlawful by subsection (A) of this section or which the commission finds is contrary to the public interest,

"3. To determination of whether the contract is an amendment of a producer contract which shortens the duration of the contract, increases the price to be paid thereunder, or materially reduces the consideration received or to be received by the purchaser thereunder,

"4. To determination of the reasonable market price of the natural gas at the delivery point specified in the contract, at such time or times as provided for in Section 16, and,

"5. To the issuance of such orders, decisions, and regulations with regard to the contract as are authorized under this section and Section 16.

Q. How would the FPC go about determining a fair market price?

A. It would take into consideration general economic conditions and trends, the need for providing an adequate supply of gas to consumers, trends in cost of exploration, development, production, and drilling—all of the costs involved in providing gas.

Q. Costs would be a factor?

A. There is no way to keep cost out of the picture now. I don't think a bill could be passed without including some provision for consideration of cost. But as I pointed out, the strict utility cost-of-service approach would be prohibited. Cost trends would be just one of the factors.

Q. Would the FPC's area-pricing approach be feasible under the new bill?

A. Not as it is now applied under present rules. That is, under this new bill the commission couldn't set a specific price for a given area and then automatically approve all contracts falling within that price. The FPC would have to pass on each contract.

But area data and area conditions certainly could be taken into consideration in arriving at a fair market price. And once the FPC set a price for one producer in a given area, this could tend to set a pattern for the price to be allowed other producers in that area—unless there were good reason for a difference.

Q. How would interstate pipelines be affected directly by H.R. 7575?

A. The so-called pyramiding of rate filings would be banned because a pipeline could not file for a second rate increase until the first had been settled. However, the FPC would have the authority to grant exceptions to avoid hardships.

It seems to me that if we can eliminate the lag in handling cases at the FPC, the need for pyramiding will disappear, so the pipelines won't really be hurt by this provision.

The bill also provides that pipeline companies will

Harris Knows Gas and Politics

REP. Oren Harris, (D.-Ark.), a veteran of congressional fights over regulation of natural gas producers, has set the stage for a possible showdown by introducing a new gas bill—H.R. 7575 (OGJ, June 12 p. 79).

Harris, who entered Congress in 1941, has become a recognized authority on natural gas matters. Observers consider him the most knowledgeable congressman on the subject.

Harris was in the middle of earlier efforts to pass gas legislation. Three times he has seen a bill clear the House and two times legislation has gone to the White House only to be vetoed.

The last time that happened was in 1956, and it was a bill that Harris had co-sponsored and led through the House in a hard fight.

He has been closely involved in recent studies of regulatory agencies made by the House. He currently has a bill before Congress aimed at setting standards of ethics for

commission members and their staffs.

"He knows this natural-gas business from the field to the kitchen stove," one observer commented recently.

Harris is considered a political realist, too. That is why his current gas bill makes some concessions not made in previous bills.

He doesn't think there would be much purpose in introducing an "ideal" bill if it was certain to be defeated.

Those who know him well say he isn't too happy himself over some provisions of the new bill, but that he feels it is the best that can be achieved under the circumstances.

His new bill is obviously aimed at preventing a fight between segments of the industry and at meeting objections to earlier legislation raised by consumer groups and others.

His inclusion of a small-producer exemption is apparently an attempt to win White House backing, and some of the other provisions evidently are aimed at giving the Federal Power Commission some rule changes it has been seeking.

Harris, born in Arkansas in 1903, got his law degree at Cumberland University Law School and entered law practice in Arkansas in 1930.

He was a prosecuting attorney before he was elected to Congress in 1940.

Brass Tacks
FROM HALLIBURTON

FRACPLAN Successes Across the Oil Country

Acid failed to help: A FRACPLAN Did!

Lea County, N. M. — After acidizing failed to improve production of this newly completed oil well, the operator consulted with Halliburton who recommended a FRACPLAN. Treatment at approximately 5,000 ft. consisted of fracturing with 525 lbs. of low fluid loss additives which were premixed with 21,000 gal. of crude. Walnut hulls were used as propping agent. After treating, the well was swabbed in, showing a potential of 114 BOPD on a 24/64″ choke with pressures of 160 psi tubing and 475 psi casing.

No Treatment Worked — Until FRACPLAN

Ontario, Canada — A FRACPLAN resulted in successful fracturing jobs in the onshore Clinton formation in this province where all earlier stimulation efforts were reported to have failed. Here are typical results:

Well No.	*Before FRACPLAN*	*After FRACPLAN*
1	160,000 cu. ft./day	710,000 cu. ft./day
2	24,000 cu. ft./day	400,000 cu. ft./day
3	33,000 cu. ft./day	56,000 cu. ft./day

This operator has scheduled *eighteen more wells* for FRACPLAN treatments following these impressive production improvements.

Well Production Equal to Ten Offsets

TXL Field, West Texas—This well potentialed 350 BOPD after a Halliburton FRACPLAN recommendation was followed consisting of 15,000 gal. of treating fluid (Acidfrac), 10-20 sand and 12-20 walnut hulls. This compared with 30 to 40 BOPD averaged by offset pumping wells — and the FRACPLAN well after 4 months was capable of *flowing* at the rate of 320 BOPD! Halliburton's Acidfrac operation ran perfectly in a difficult-to-treat Devonian middle lime formation at 7,900 ft. The operator reports an increase in his drilling program is being considered after these excellent FRACPLAN results.

A FRACPLAN Yields 500% Gas Production Increase

Mesa County, Colo. — By following a FRACPLAN this 900,000 cu. ft. per day well was turned into a 5,650,000 cu. ft. per day producer. Treatment consisted of 1,000 gal. of 15% MCA acid, jumping production to 1,800,000 cu. ft. per day. This was followed by a 21,200 gal. fracturing treatment (No. 2 diesel oil with Halliburton FL-2) including 5,500 lb. 20-40 sand and 625 lb. 12-20 rounded walnut hulls.

GET THE MOST FROM YOUR FRACTURING DOLLAR. A Halliburton FRACPLAN is designed to provide the best combination of fluids, propping agents, pumping equipment, and skilled personnel — and only Halliburton has it. Call today.

FRACTURING SERVICES

HARRIS says consumer interests will benefit from bill.

be allowed a fair market price for gas which they produce. This is something they have been seeking.

The other provision affecting them repeals the present exemption of industrial rates from FPC suspension.

As it is now, the commission can suspend commercial and domestic rates but not the sales for resale for industrial use. The provision in the bill would put them all on the same basis. But FPC still would not have jurisdiction over direct sales of industrial gas—just over sales for resale.

Q. How would distributors be affected?

A. Distributing companies have begun to get concerned over supplies. This bill would, as I see it, provide incentive to producers to develop new supplies and put them on the interstate market. As it is now, many producers try to sell their gas for use within the producing state so they will not be subject to federal control. I am told that about 40% of the present production is consumed locally. That means it isn't going into interstate pipelines.

Also, distributing companies will have an opportunity to become a party of interest to any rate changes affecting them and a chance to protest if they feel that the rate is unreasonable.

Technically, they already have this right, but because of the innumerable difficulties the FPC faces in trying to work out a solution to regulatory problems under present law, this hasn't done them much good.

The distributing companies should also realize that they will probably be able to buy their gas at a lower price under a fair-market-price concept for producers then they would if producer rates were set up on a strict cost basis. In the Phillips case, the FPC found that Phillips would get a lot more under a utility rate procedure than it had asked for in its rate filings.

Q. The question is sure to be raised about what the impact would be on the consumer. What is your opinion?

A. I think that the faster, better handling of cases at the FPC under the provisions of this bill would tend to keep prices from going up and would tend to encourage an increase in gas supplies.

Either of those developments would benefit the consumer.

Unless there is adequate incentive for the producer, we are going to run short of gas. If there is proper incentive, there will be enough gas.

I have pointed out, too, that consumer interests would be represented in rate hearings.

Gas Drilling Tried on Gulf

- Engineers study Texas shale formation for application of money-saving gas method. Hopes high for third test.

MOBIL Oil Co. is meeting with only limited success in its efforts to develop gas drilling along the gulf.

But its engineers say they are confident that, under proper conditions, they can save huge sums with the method.

In Mobil's second test using gas, the bit went 255 ft. at the rate of 117 ft. per hour. Unfortunately, sloughing shale caused the bit to stick and the operators fell short of their goal of moving some 900 ft.

However, the speed accomplished with gas gives Mobil hope that it can find other hard-shale sections in the ordinarily soft formations of the Gulf Coast where the method can be used.

Gas and air drilling have long been used in the hard formations of West Texas but are seldom used on the Gulf Coast because there are so many porous water-bearing sands.

The new Gulf Coast test occurred at the B. T. Wait FX unit 2, Iowa field, Calcasieu Parish, Louisiana, about 10 miles northeast of Lake Charles.

A Circle Drilling Co. rig drilled with mud to the Hackberry Miocene at 9,087 ft. and then converted to gas to drill to 9,342 ft. before encountering trouble. The well was drilled to 10,502 ft. conventionally.

Mobil said it is not economical to drill a section as short as 255 ft., but had the operator succeeded he would have completed the 900-ft. section in a single day, compared with the 14 days of elapsed time that was actually required.

The test was in a gas field development well, and Mobil was well acquainted with the geology and pressures expected.

Mobil's first official effort at using gas along the Gulf Coast took place in Lavaca County, Texas, where it drilled more than 1,000 ft. in the 1 Jim Orsak, Jr., about 75 miles inland.

The test ran into trouble when water flooded the hole. Several years ago, before the current program started, the company successfully drilled with air through a Gulf Coast salt dome.

Mobil has not decided where to make its next try but is looking at the Wilcox trend in the Corpus Christi area for a spot where gas drilling would be applicable.

Tanker Needs Will Stay High Through '62

• Growing demand for oil products has taken many ships off the idle list, but the rate of increase in tanker requirements will soon ease off, tanker conference told.

THE STRONG demand for tankers that developed last year and is continuing this year will stay with us through 1962.

But after that the rate of growth in tanker needs will taper off. The reason, says Sun Oil economist James S. Cross, is that new sources of oil will mean shorter tanker hauls to Europe and, in addition, there will be increased competition from pipelines and from other fuels.

Cross told the annual Tanker Conference in Cape Cod last week that a large increase in tanker requirements last year was due to a jump in petroleum demand and longer hauls.

"It is expected that there will continue to be some surplus tonnage in the fleet during the next 5-year period, but this surplus will reach a point in the near future where seasonal tightness in the market may be anticipated," he says.

Concerning ocean movements, Cross says:

... **Greatest tanker** requirement increase will occur in the Africa to Europe route, followed by the Middle East to Far East, and Middle East to Australian trades.

Tanker shipments from North and West Africa to western Europe in 1959 totaled 70,900 bbl. a day, and he thinks they will reach 1,303,000 bbl. daily in 1965.

"By 1963, the Sahara will become a major crude source for western Europe, thus reducing the growth in crude shipments to West Europe from the longer Middle East and Caribbean runs," he says.

... **Middle East** to Europe shipments by 1965 will require the equivalent of 1,163 T-2 tankers and will remain the dominant route.

The T-2, built domestically during World War II, is the criterion of tanker measurement. A T-2 has a capacity of 138,000 bbl.

... **Shipping requirements** from the U. S. Gulf Coast to the U. S. East Coast will increase during the next 6 years at an average annual rate of 2.3%.

This means only 6.7% of the world fleet will be needed for the coast trade in 1965, compared with 8.4% in 1959.

In his study of consumption and production patterns, Cross reports western Europe is expected by 1965 to consume 24% of the free world's demand for liquid hydrocarbons—an increase of 4.3% over 1959.

In the Oceania, South and East Asia area, consumption will grow from 6.6% of the total in 1959 to 10% in 1965.

"A most noteworthy change in the pattern of production will occur during the next 5 years when Africa emerges as a major production area," he says.

"By 1965, Africa and West Europe together will produce over 7% of the free world's crude supply, compared with only 2.2% in 1959.

"All other major producing regions will decline in relative importance, except the Middle East, which will gain slightly."

How Demand and Production Are Changing

Demand:

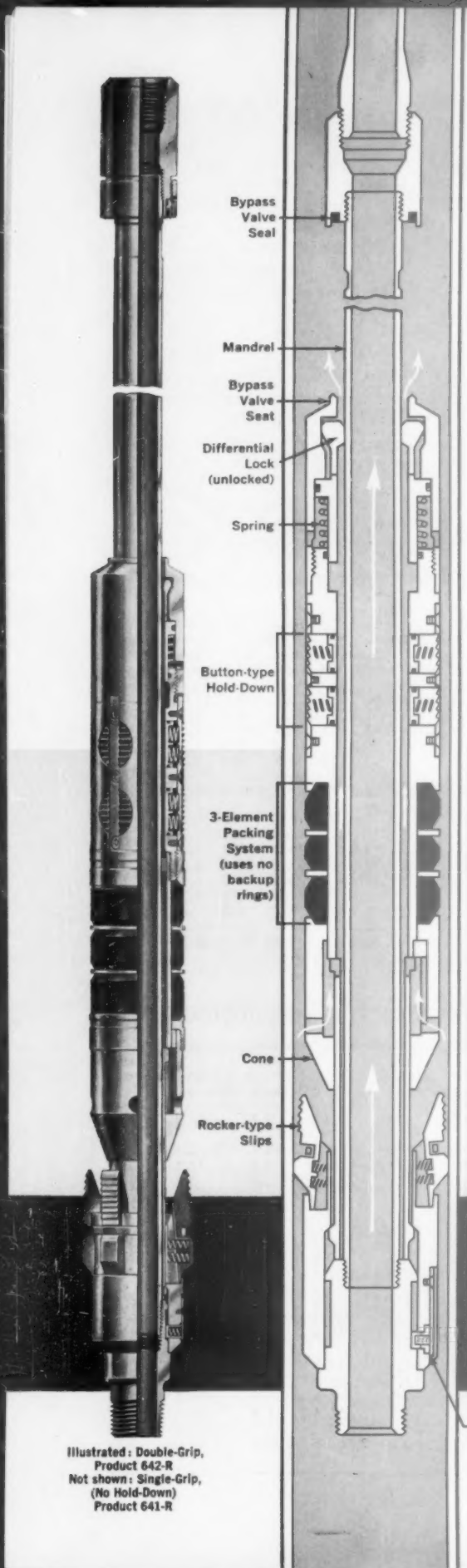
	1953		1959		1965	
	Thous. of Bbl. Daily	% of Total	Thous. of Bbl. Daily	% of Total	Thous. of Bbl. Daily	% of Total
United States & Canada	8,148.5	66.1	10,250.9	59.6	11,988.0	51.5
Latin America	1,017.5	8.3	1,537.8	8.9	2,115.0	9.1
Western Europe	1,787.0	14.5	3,385.8	19.6	5,554.0	23.9
Middle East & Africa	621.0	5.0	911.0	5.3	1,270.0	5.5
Oceania, South & East Africa	754.0	6.1	1,145.5	6.6	2,316.0	10.0
Total Free World	12,328.0	100.0	17,204.1	100.0	23,244.0	100.0

Production:

United States & Canada	7,342.4	58.8	8,439.2	48.2	9,953.0	42.9
Latin America	2,278.0	18.2	3,564.4	20.3	4,600.0	19.8
Middle East	2,424.3	19.4	4,605.6	26.3	6,245.0	26.9
Africa & Western Europe	117.7	0.9	380.8	2.2	1,786.5	7.7
Far East & South Asia	330.9	2.7	529.7	3.0	622.2	2.7
Total Free World	12,493.3	100.0	17,519.7	100.0	23,206.5	100.0

And Expected Shifts in T-2 Requirements

	1959		1965			
	T-2 needs	% of total world	T-2 needs	% of total world	% Change 1959-1965	Annual % change 1959-1965
U. S. Gulf to East Coast	220.5	8.4	253.3	6.7	14.9	2.3
Caribbean to:						
U. S. East Coast	145.9	5.6	165.5	4.4	13.4	2.1
Canada	38.1	1.5	54.7	1.5	43.6	6.2
Europe	158.3	6.1	164.4	4.4	3.9	0.6
North and West Africa to Europe	6.7	0.3	118.7	3.2	1,671.6	61.5
Middle East to:						
U. S. East Coast	118.8	4.5	144.2	3.8	21.4	3.3
U. S. West Coast	82.6	3.2	94.5	2.5	14.4	2.3
Europe	875.7	33.6	1,162.5	30.9	32.8	4.8
South Asia and Indonesia	45.5	1.7	76.4	2.0	67.9	9.3
Far East	142.7	5.5	389.0	10.3	172.6	18.2
Australia	75.3	2.9	152.9	4.1	103.1	12.5
Indonesia to:						
U. S. West Coast	41.7	1.6	42.3	1.1	1.4	0.2
Europe	28.5	1.1	32.2	0.8	13.0	2.1
Far East	26.3	1.0	36.5	1.0	38.8	5.6
Australia	35.1	1.3	51.4	1.4	46.4	6.6
All other trades	568.0	21.7	822.3	21.9	44.8	6.4
Total world needs	2,609.7	100.0	3,760.8	100.0	44.1	6.3



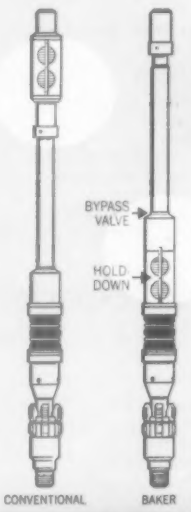
Illustrated: Double-Grip, Product 642-R
Not shown: Single-Grip, (No Hold-Down) Product 641-R

A new concept in retrievable casing packers

BAKER MODEL "R"

DOUBLE-GRIP RETRIEVABLE CASING PACKER

- **An advanced new long-stroke (30") packer... with simple one-turn-right control-pin setting, automatic bottom and integral hold-down.**
- **Designed for combination acidizing, fracturing and production operations.**



LOCATION OF THE HOLD-DOWN IS FUNDAMENTAL TO THE NEW CONCEPT

In most conventional long-stroke packers, the hold-down is attached in afterthought-fashion to the mandrel, above the bypass valve. Hold-down buttons are directly exposed to button-dulling pressure surges in the tubing and to particle-bearing fluids that may deposit solids behind them. The bypass valve cannot be used to equalize pressures.

In the Baker Model "R" Packer, the hold-down is an integral part of the packer, below the bypass valve. This new concept restores surface control of the bypass valve for pressure equalization.

PERFORMANCE-PROVED FEATURES

The new design concept alone would doubtless make the Model "R" a superior packer. But it offers much more. For into it Baker has built components of the type proved on their high-performance service tools... features like those shown at right, and never before available in long-stroke packers.

Today's practice of fracturing and acidizing in combination with production—both initially and later—requires a new type of packer. It must dependably hold pressures from below and at the same time perform as an efficient production packer. It must be simply run and easily retrieved by the operator.

Afterthought Hold-Downs Not the Answer

Conventional long-stroke packers with a hold-down added to the mandrel as an extra cannot fully meet this need—they were never really designed for this kind of use.

The added hold-down created problems, and often did not hold dependably. Operators found that hold-down buttons would dull on the way in. The packer often proved difficult to release as there was no simple way to equalize pressure across the hold-down, and sand or frac materials tended to keep the buttons from retracting.

A New Concept Was Needed

In designing the Model "R" Packer to meet the operator's needs, Baker came up with a whole new concept. As explained below, button dulling has been minimized because the ample bypass area is completely isolated from pressure surges in the tubing. Pressure differentials across the hold-down and the packer can be instantly equalized by simply picking up on the tubing. The mandrel can be used as a jar at any time, as it is not held inoperative by the hold-down.

To the many advantages brought about by a new design approach, Baker added high-quality, performance-proved components never before found on long-stroke packers.

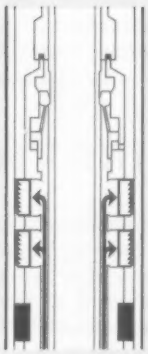
Baker Stands Behind Every Packer

Back of the Model "R" is the Baker Service Organization. Domestically, 62 Baker field-service warehouses stand ready to supply packers, parts and repair service. Over 400 Baker servicemen are available to help you in planning applications for this packer. Why not ask one of them to tell you more about the great new Model "R" Packer.

BAKER

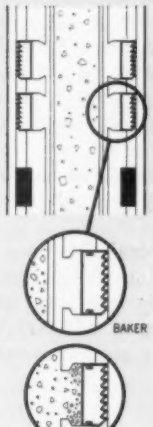
BAKER OIL TOOLS, INC.

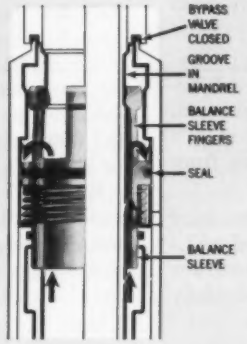
HOUSTON/LOS ANGELES/NEW YORK



HOLD-DOWN IS ACTUATED BY PRESSURES FROM BELOW PACKER. The hold-down buttons are isolated from pressure surges in the tubing. Surface bleed-off is never required, as the bypass valve can be opened at anytime. Pressure differentials can be instantly equalized, even if the tubing is plugged.

BUTTONS ARE ISOLATED FROM CONTAMINATED FLUIDS. Sand and other solids cannot build up in back of the buttons and thus interfere with button retraction.

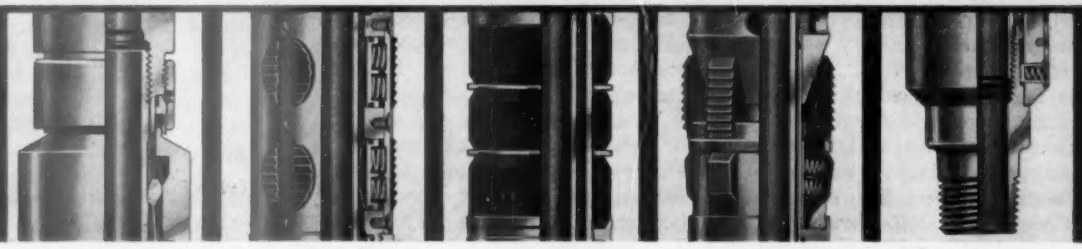




BALANCE SLEEVE IN LOCKED POSITION

UNIQUE DIFFERENTIAL LOCK HOLDS BYPASS VALVE CLOSED. Shown at left, in relation to the packer body, is the Balance Sleeve which forms an important part of the Differential Lock. Note how pressure differentials from below the packer act on this sleeve to force it down so that the fingers of the sleeve wedge into the groove in the mandrel. The very pressure that acts to pump the valve open thus acts to keep it closed—eliminating the need for high tubing set-down weights.

UPWARD MOVEMENT OF TUBING RELEASES LOCK. No rotation or pressure equalization is required.



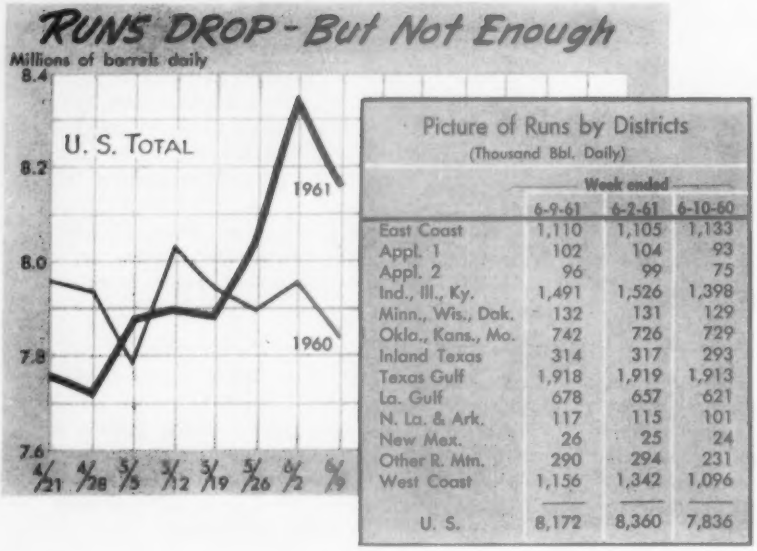
NEW FACE-SEAL BYPASS VALVE
Instant acting—seals on contact, opens with ¼" pickup. Overcomes plugging and sticking.

PRECISION HOLD-DOWN BUTTONS
Precision fitted to minimize sticking and fouling. Tapered upper surface of teeth aids retraction.

THREE-ELEMENT PACKING SYSTEM
Proven Baker design. Holds under extreme conditions, releases readily. Uses no metallic back-up rings.

DEPENDABLE ROCKER-TYPE SLIPS
Simple, compact, trouble-free. Won't wedge or stick. Performance proved on Baker service tools.

NEW AUTOMATIC BOTTOM
Automatically locks slips in retracted position when tubing is raised the full stroke of the mandrel.



Picture of Runs by Districts
(Thousand Bbl. Daily)

	Week ended		
	6-9-61	6-2-61	6-10-60
East Coast	1,110	1,105	1,133
Appl. 1	102	104	93
Appl. 2	96	99	75
Ind., Ill., Ky.	1,491	1,526	1,398
Minn., Wis., Dak.	132	131	129
Okla., Kans., Mo.	742	726	729
Inland Texas	314	317	293
Texas Gulf	1,918	1,919	1,913
La. Gulf	678	657	621
N. La. & Ark.	117	115	101
New Mex.	26	25	24
Other R. Mtn.	290	294	231
West Coast	1,156	1,342	1,096
U. S.	8,172	8,360	7,836

Only West Coast Really Cut

REFINERY runs dropped last week, but they still are too high to balance with the seasonal decline in petroleum demand.

Refiners put 8,172,000 bbl. daily of crude through their plants for the week ended June 9. This represents a drop of 188,000 bbl. daily from the previous week.

This comparison is deceiving, however, because runs the week before were near record levels and, besides, 186,000 bbl. daily of last week's cutback in runs came from the West Coast.

In the 2-week period from May 19 to June 2, runs increased 467,000 bbl. daily. West Coast runs accounted for 112,000 bbl. daily of this gain. Thus the sharp cutback on the West Coast last week returned operations there nearly to normal. Refiners in other sections account for the excessive runs.

The demand picture shows clearly why runs are out of joint. Total demand averaged about 8,900,000 daily for the 2-week period ended June 9. This represents a decline of about 915,000 bbl. daily from the estimated average for April. Runs for the same period increased 464,000 bbl. daily over the average for April.

Even with a liberal allowance for seasonal patterns, a gain in runs of 464,000 bbl. daily at a time when demand has dropped 915,000 bbl. daily doesn't make good economics.

Oil-Pipeline Antitrust Issue Raised

THE Justice Department is "concerned" over antitrust problems stemming from oil refinery ownership of oil pipelines.

Lee Loevinger, head of the department's antitrust division, told a House committee last week that the department is going to look into the situation further. But, he said, the Government's effectiveness in the matter has been lessened by court rulings.

Loevinger was before the committee to talk about some consent decrees the committee had asked about specifically, and the 1941 pipeline consent decree under the Elkins Act was one of them.

Loevinger, citing the Arapahoe Pipe Line Co. case, said the antitrust division's powers over an oil pipeline's earnings had been reduced by the courts to the point of virtual ineffectiveness.

He noted that the consent decree's limitations apply solely to distribution of dividends—not earnings. A company therefore could plow earnings back into expanding or improving its system and thereby avoid exceeding the limit placed on dividend distribution, Loevinger told the committee.

He said also that because the pipelines have "considerable" discretion in determining rates and returns on each segment of their operations, they are able to adjust their rate scales to their own advantage.

For example, he said, returns on gathering lines which are operated primarily for the convenience of the owner are "strikingly" lower than on trunk lines. This means, he reasoned, that the lower gathering rates can be used to balance higher trunk line rates to the advantage of the shipper-owner.

In reply to a question, he conceded that Justice Department had not had any serious complaints about pipeline rates in several years.

The antitrust chief made it clear he feels that even if the pipeline consent decree had been enforced to the extent Justice had originally sought, it still would not have gotten entirely to the heart of the problem.

"The more serious antitrust problems inherent in refinery ownership of pipelines are the consequent monopoly position in crude-oil purchase they gain from a monopoly of the transportation system," he said.

INDUSTRY

First well in the sedimentary area north of the Arctic Circle is planned for this year by Dome Petroleum, Ltd. A rig will be shipped soon to the Canadian Arctic island of Melville. The island is accessible by icebreakers between June and November.

No state law violation was found in a 4-month study of fuel oil prices by a special Rhode Island House of Representatives committee. Conclusion was price fluctuations are a response to the laws of supply and demand.

Merger with Arkansas-Louisiana Gas, Shreveport, La., has been approved by stockholders of Midsouth Gas Co., Little Rock, Ark. If approved by regulatory agencies, the merger will give Ark-La 48,300

adding: "It seems efforts to enforce the decree are only a partial solution."

Loevinger also revealed that the Justice Department plans to announce soon a new policy regarding consent decrees. This would require that consent settlements be made public before they are "finalized" so that interested parties could comment on them.

American Oil Favors "Local Pricing" Plan

THE product pricing executive of American Oil Co., William C. Marquis, says the only sensible and workable way to price is in conformity with local economic and competitive conditions.

Marquis in an address before the Northwest Petroleum Association at Duluth questioned the practicality of many wide-area pricing plans now being used in the oil industry. He added American has no intention of using the idea.

Marquis said difficulties about wide-area pricing begin with the definition of the proper trading area, continue with the definition of a realistic price for that area, and are compounded by the wiping out of temporary competitive allowances to jobbers or dealers or both.

Oil-Import Levels Slashed

• Last half levels will be lowest since the mandatory control program started.

Oil-import levels for the last half of this year will be the lowest since the mandatory program was started, and about 66,000 bbl. daily below the last half of 1960.

Part of the drop resulted from an amendment in the import rules last December which specified that if actual demand during a given period fell short of estimated demand, an offsetting reduction would be made for the following period.

The Bureau of Mines estimate for the upcoming allocation period, which begins July 1, is for 8,581,000 bbl. daily in Districts 1-4. For District 5, where allocations are based on the difference in estimated supply and estimated demand, a difference of 305,000 bbl. daily has been forecast for the next period, including about 64,000 bbl. daily of estimated exempt imports.

As a result of these estimates, Interior has set maximum import levels of crude and unfinished oil into Districts 1-4 at 670,000 bbl. daily for the last 6 months of this year. For finished products, the limit will be 76,634 bbl. daily.

For District 5, the level will be 230,298 bbl. daily for crude and unfinished oil and 10,679 for products, including residual fuel oil.

For Puerto Rico, the allocations are for 87,611 bbl. daily of crude and unfinished oil and 1,998 bbl. daily of products, including residual.

Refiners in Districts 1-4 whose quotas are based on refinery throughput will receive allocations based on the following table:

Avg. B/D Input	% of Input
0- 10,000	11.1
10- 20,000	10.2
20- 30,000	9.3
30- 60,000	8.3
60-100,000	7.4
100-150,000	6.5
150-200,000	5.5
200-300,000	4.5
300,000 plus	3.7

For refiners in District 5 who get allocations based on throughputs, the formula is:

Avg. B/D Input	% of Input
0- 10,000	42.1
10- 20,000	32.9
20- 30,000	23.8
30- 60,000	14.1
60-100,000	11.3
100-150,000	10.3
150-200,000	9.3
200,000 plus	7.4

BRIEFS . . .

customers in eastern Arkansas—only area of the state it does not serve.

Two new publications have been announced by American Petroleum Institute. "History of Petroleum Engineering" and the 1960 edition of "Drilling and Production Practice" are available from API Division of Production, Dallas.

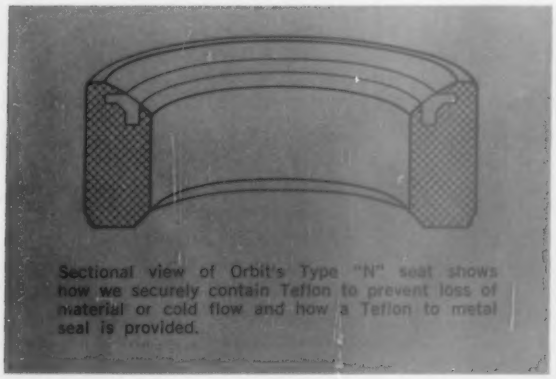
Proposed sale of Honolulu Oil's Industrial Research Division to International Rectifier Corp. of El Segundo, Calif., has been announced. Involved in the $2-million deal are laboratory and manufacturing facilities in Los Angeles and New Brunswick, N. J. Honolulu Oil is prepairing for liquidation (OGJ, June 12, p. 95).

Pennant Drilling Co., Ltd., has been brought from Canadian Homestead Oils, Ltd., by C. E. Wright and F. M. Stevenson, Denver, owners of Signal Drilling & Exploration, Inc., and Signal Oilfield Service, Inc. Wright and Stevenson founded Pennant 10 years ago but sold control to Canadian Homestead. They have continued to serve as president and vice president. Wright said rigs will be added to give Pennant greater flexibility below the 9,000-13,500-ft. range.

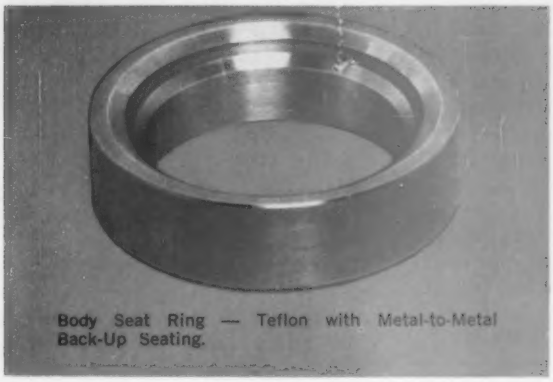
Mechanical imprinters for handling credit cards will be placed in most Gulf service stations within 3 months. Eight electronic scanning devices for billing at regional offices will be in use by the end of the year. First disclosure of the automated billing system, which will be 10 times the speed of manual operations, was made last month (OGJ, May 22, p. 41). Gulf has issued more than 3 million credit cards which produce about 75 million sales invoices annually.

An underground gas-storage field being developed in Greene County, Indiana, by Citizens Gas & Coke Utility will be completed in October. The 10,000-acre field will have a capacity of 14 billion cubic feet of gas. The utility will move gas to Indianapolis when a pipeline is built.

Sinclair departs from conventional ship design in plans for an American flag tanker to be built in Maryland. It will be minus the traditional midship bridge and superstructure. Navigation and living quarters will be in the stern. The tanker will be 736 ft. long with a 395,000-bbl. capacity and speed of 16½ knots. Completion is set for March 1963.



Sectional view of Orbit's Type "N" seat shows how we securely contain Teflon to prevent loss of material or cold flow and how a Teflon to metal seal is provided.



Body Seat Ring — Teflon with Metal-to-Metal Back-Up Seating.

ORBIT COMBINES THE THREE BEST KNOWN SEATING PRINCIPLES IN ONE VALVE SEAT

ORBIT TYPE "N" BODY SEAT WITH MOLDED TEFLON* FEP RESIN PROVIDES:

(1) resilient seating with metal-to-metal back-up

(2) friction-free seating

(3) seating without lubrication

*Teflon is duPont's registered trademark for its family of fluorocarbon resins, including FEP resin.

FOR ADDITIONAL INFORMATION
WRITE FOR BULLETIN No. 400

The convex seating surface formed by the Teflon and metal provides for absolute shut-off and assures immediate contact for positive closure. The Teflon is so contained that it is not affected by high differential pressures flowing across the seat. Normal manufacturing tolerances as well as normal valve wear are compensated for by the resilient Teflon material. Solid particles do not prevent the Orbit Valve from seating properly. Orbit's Type "N" seat provides both metal-to-metal and Teflon sealing. The metal-to-metal seat, provided by tapered metal edges, is additional assurance that seating surfaces will not be lost in case of disaster by fire. Heat treated metal seat retainer holding Teflon provides durable working surfaces.

Orbit Valves are available in a full range of sizes beginning with 1" and in test pressures to 10,000 Lbs.

ORBIT VALVE COMPANY
P. O. Box 699 Tulsa, Oklahoma
PHONE LUther 4-4761 TWX TU 925

ORBIT VALVES

Contract Let for Huge Mobile Rig

- Kermac platform will break records for size, cost, depth capability.

CONTRACT for the largest mobile drilling platform in the offshore oil industry has been let by Kerr-McGee Oil Industries, Inc.

Kermac Rig 54, costing an estimated $6.5 to $7 million and capable of working in 175 ft. of water, will be built by Avondale Marine Ways.

Engineering and tooling for Rig 54 is under way at Avondale's yards on the west bank of the Mississippi River above New Orleans. Target date for completion is April 1962.

Kerr-McGee officials believe that by then there will be a good demand by offshore oil operators for equipment that can wildcat in the deeper waters off the Louisiana coast.

Kerr-McGee is taking this pioneer venture with the safest and most economical rig its engineers could design.

The structure . . . Kermac Rig 54 will be big by any standards.

It is designed in the shape of an equilateral triangle with lower hull sides 330 ft. long. It will be 200 ft. from mud line up to working level and another 175 ft. to the top of the derrick.

The outfitted structure will weigh about 7,500 tons and will carry large amounts of dry and liquid stores.

A large compartmented tank will be installed at the bottom of each of the three corners. When pumped dry, these tanks support the structure at the sea surface by their buoyancy. When flooded, the tanks become footings to support the structure on the sea floor.

The corner footings are 20 ft. deep, and each has a volume about equal to that of the main hull for the pioneer offshore submersible barge, Kermac Rig 40, which went to work in 1948.

The footings and working level are linked by three 200-ft. tall conical-shaped stabilizing columns which are 30 ft. in diameter at the bottom and taper to 14-ft. diameter at the top. They are internally supported and framed from top to bottom.

Vertical, horizontal, and diagonal cylinders of 4 to 8-ft. diameter tie the decks, footings, and stabilizing columns together into an integral space-frame.

The stabilizing column provides the necessary buoyancy and leverage to keep the structure level while it is in transition between the surface and the sea bottom.

Rig 54 will be submerged by flooding the tank-type footings and conical stabilizing columns. Pumps installed in the three corner columns and controlled from a single station will dewater the structure.

Balance is maintained between the amount of flooding, the weight of the structure, and the condition of the sea bottom. At locations where the bottoms consist of thick, soupy mud, the rig is ballasted to practically float on the ocean floor.

Kerr-McGee construction and engineering officials C. J. Colby and Paul Wolff report that the columns-stabilized submersible concept was adopted because of its success in Rig 46 and later models built from the same plans. There is safety and economy in the absence of any moving parts to raise or lower the rig on location.

Most of the basic design features have been thoroughly pretested, since the new rig incorporates the desirable improved safety features of Kermac Rig 46. This earlier Kerr-McGee offshore giant has worked

for nearly 5 years, weathering storms and hurricanes in the Gulf of Mexico without damage.

Chief differences between Rig 54 and Rig 46 are in:

... Size. The new rig is nearly twice the over-all size of the earlier version in order to operate in deeper waters and still be able to withstand storms.

... Shape. The triangle design of Rig 54 was adopted to give it added strength while cutting down sharply on the amount of structural steel which a rectangular design would require.

The equipment . . . Drilling equipment as presently planned will be built around a diesel-electric draw works, driven through two 600-hp. d.c. motors, and a mechanical compound drive for two 1,000-hp. drilling mud pumps.

The mud-mixing pump will be independently diesel-powered.

The derrick will be designed for high wind loads and have provisions and capacity for stringing twelve 1⅜-in. lines. Total wet mud capacity is 1,500 bbl. with electrically driven equipment for transfer and for continuous agitation.

Pressure tank storage of 5,740 cu. ft. will be provided with pneumatic transfer facilities to handle dry cement and barite. Additional cement and barite in sacks or in smaller bulk cans can be stored in the large warehousing area.

A loading area on each side of the structure plus a work area near the well will be serviced by a single large crane. Smaller mobile material-handling equipment will supplement the crane.

The drilling operations will take place from the large deck area at the base of the triangle. The smaller deck area at the apex farthest from the well will support the quarters and some of the bulk-storage tanks. The air-conditioned quarters will house 45 to 50 men. The quarters' housetop forms the heliport.

The quarters area will be connected by walkways to the machinery house at one corner of the drilling area and to the mud and pump house at the other.

The derrick is cantilevered over the side. The position of the derrick is adjustable in two directions.

The outlook . . . The Kerr-McGee investment reflects the steady improvement in drilling operations in the offshore Louisiana area, particularly at greater depths.

F. C. Love, Kerr-McGee executive vice president, says the company has no fixed-term contract with any major or syndicate for hiring Rig 54. It will be available on a first-come, first-served basis.

This in itself is a slight departure from only a few years ago when a drilling contractor had work lined up before a new expensive offshore rig was ordered.

Love says Kerr-McGee executives, however, are confident there will be demand for the rig because the wildcatting trend in offshore Louisiana waters is toward the deeper areas.

Limit of available equipment is 150-ft. water in which Mr. Gus II can operate. Mr. Louie can operate in 130-ft. water, while the range of other deep equipment now is about 100 ft.

Rig 54 probably will be contracted mainly on a day basis.

Basic rates have not yet been set.

New gas-gathering system programed for South Texas

LONE Star Gas Co., Dallas, has formed a subsidiary which will build a gas-gathering system in South Texas.

Lone Star Gathering Co. will run 63 miles of various-sized lines in DeWitt and Victoria counties. The system will gather gas from producers in DeWitt County and deliver it to a purchasing pipeline in Victoria County.

L. T. Potter, Lone Star president, says the facilities will cost an estimated $2.5 million and will have a maximum capacity of 60,000 M.c.f.d. Construction will begin when regulatory authority is obtained.

There are 32 wells on acreage to be served by the system, including wells owned by Lone Star Producing Co., another subsidiary. The developed leases contain an estimated 138 billion cubic feet of proven natural gas reserves.

Lone Star Gas Co. will buy up to 25,000 shares of the gathering company's common stock which has a par value of $100 per share.

Slash Made in

LOUISIANA has whacked its per-well allowable to an all-time low.

Burden of the cut is on production which is based on Louisiana's depth bracket allowable.

But if market demand conditions do not improve over the next 2 months the burden may be shifted to multiple completions and to certain wells with high gas-oil ratios.

The heavy slash last week followed on the heels of some rather acid remarks by Conservation Commissioner James H. Gill concerning criticism of Louisiana's production allowables.

Gill was nettled at the recent meeting of the Interstate Oil Compact Commission in Houston, where a Texas speaker said that the only states prorating to market demand were Texas, Oklahoma, and Kansas (OGJ, June 12, p. 84).

The cut . . . Last week's depth bracket allowable order for July and August fixes production at 30% of the March 1953 level, down from the 33% figure in effect since May 1, 1960.

The previous low figure was 31% during May, June, and July of 1958.

PIPELINE

Utah's Public Service Commission will be asked to approve construction of the 200-mile line from the San Arroyo and Bryson Canyon fields to the Kennecott Copper plant in Salt Lake City. Utah Gas Pipeline Corp., sponsor of the project, will reinstate its recently withdrawn application. The line, to be supplied by Sinclair Oil & Gas and Trend Oil, would cost $15,000,000.

Two Houston Contracting Co. spreads will work on the 161-mile 20-in. gas line which Texas Eastern Transmission will lay between West Monroe, La., and Kosciusko, Miss. Work will begin in August.

A 93-mile, 34-in. gas line will be built from Ivanpah to Newberry, Calif., by Southern California Gas and Southern Counties Gas. The

Louisiana Per-Well Allowable

Each drop of 1% in the allowable represents about 21,000 bbl. daily of production. Thus, the 3% drop means a gross loss of about 63,000 bbl. daily. However, new production averages about 8,000 bbl. daily each month, or 16,000 bbl. for the 2-month period.

The net loss of 45,000-50,000 bbl. daily will bring Louisiana's total production to well below the 1,000,000-bbl.-per-day mark. Current production is about 1,020,000 bbl. daily.

Basic reasons for the sharp cut are the alarming rise in stocks and a fall-off in nominations.

Although nominations dropped only 8,000 bbl. daily, Gill believes the rise in stocks justified the cut in production.

What next? . . . Gill seriously considered using an entirely different approach to the problem of reducing production—and he may do just that when the September-October allowable is set.

Gill told the market demand hearing that multiply-completed oil wells have an economic advantage over singly-completed wells in the same pool and they should help bear the brunt of an allowable cut.

Already Louisiana has eliminated multiple allowables for new completions, except for duals. The next step may be that multiples, new and old, will get only single allowables or be cut a certain per cent.

Gill said also he may take away the allowables now being granted certain wells with high gas-oil ratios. Louisiana presently limits the GOR of an oil well to 2,000 to 1 and assesses an allowable penalty against a well exceeding that amount.

However, it makes certain exceptions when the gas is sold to a gas pipeline or used in the field and not flared. It would be these exceptions, which account for about 25,000 bbl. daily of crude production, that would lose their allowables.

Defense . . . To correct the impression that Louisiana has failed to do its share of keeping production in line with market demand, Commissioner Gill released a set of statistics explaining why total production has risen during a period when production has dropped in a number of other states.

Citing figures of the American Petroleum Institute and the American Gas Association on proved reserves, Gill said that between 1950 and 1960 Louisiana increased its percentage of national reserves from 8.7% to 15.1%, a total of 6.4%. But its production during the same period rose from 10.3% to 14%, an increase of only 3.7%.

Louisiana's problem obviously has been the child of success. For example, in the year 1958, the increase in Louisiana reserves accounted for 79% of the increase for all the U. S. In 1959 it was 51.8%. Last year Louisiana reserves rose by 125 million barrels, while those for the nation dropped by 106 million barrels.

Louisiana Output, Reserves Compared

	Increase In U. S. Reserves*	Increase In La. Reserves*	La. % of U.S. Reserves	La. % of U. S. Output
1950	618	275	8.7	10.3
1955	451	293	10.8	10.1
1958	236	186	13.3	11.8
1959	1,183	616	14.7	12.8
1960	−106	125	15.1	14.0

*Figures in millions of barrels. Increases are comparisons with previous year.
Source: API-AGA Proved Reserves reports.

BRIEFS . . .

$11.5-million project will be completed by Jan. 1, 1964, in time to pick up gas moving into California through the Rock Springs line. Other construction includes an 8,000-hp. station at Newberry and a 2,000-hp. station at Needles, Calif.

Contract to build the 103-mile 20-in. gas line from Uinta basin to the main line of Utah Natural Gas has been let to Pease Brothers Co. It is scheduled to be completed this year. The line will be owned jointly by Mountain Fuel Supply and Utah Natural, a subsidiary of El Paso Natural.

The depleted Wharton pool in Potter County, Pennsylvania, will be the third storage field for Transcontinental Gas Pipe Line Corp. if FPC approves. Transco would spend $38,000,000 to develop the field, which would be operated by United Natural. It would add 255,000 M.c.f.d. to Transco's deliverability, raising the total it could take from storage to 745,000 M.c.f.d.

Both sales and operating revenue of interstate natural gas pipeline companies dropped in March. Sales to other companies were 772.6 billion cubic feet, down 7%, and sales to consumers were 127.8 billion cubic feet, down 5%, from March 1960. Operating revenues were $332,495,491, a drop of 2.3%. Plant investment topped $7.5 billion, up almost a half billion from a year ago.

Canada's booming gas industry hit new highs in 1960 in sales, revenue and reserves. Sales were 436 billion cubic feet, including 112 billion exported. Revenue reached $194 million and reserves set a high of 30.7 trillion cubic feet. Alberta and Ontario represented 75% of the domestic market.

Crude from the Frankston field, Anderson County, Texas, will move to Pure Oil's Nederland refinery via a 10-mile 6-in. line from the field to Pure's main line at Bullard station. Pure will also lay some 17 miles of 4-in. gathering lines in the field. Volume is expected to hit 4,000 bbl. per day.

Work will begin July 1 on Western Pacific Products & Crude Oil Pipelines' 500-mile, 12-in. line from Taylor to Kamloops, B. C. The crude and condensate line will tie in with Trans Mountain at Kamloops. Canadian Bechtel and Dutton-Williams have construction contracts. Bechtel is doing engineering work.

California's First '61 Oil Find Completed

THE FIRST oil-field discovery in California this year was completed this month by Signal Oil & Gas Co. in Kern County.

Signal's 1-16X Signal unit in Section 20-30s-28e was completed in a Miocene sand flowing 61 bbl. of 29.6°-gravity crude with 44 M.c.f. of gas daily. The well has a 0.2% water cut. Flow was through a 12/64-in. choke from selected perforations at 10,514-95 ft.

The discovery is not a big one, but at least it put California in the new-field-discovery classification for 1961.

Three new oil pools have been discovered, but no other oil fields. The best of the three is Universal Consolidated Oil Co.'s pool discovery south of Gosford. Universal has completed three dual-zone Stevens wells in this area.

There have been 47 wildcats drilled for oil during the first 5 months of the year in California. Total wildcats hit 118. These have netted one oil field, three oil pools, and 18 gas fields or pools.

Kernsumner, the name given the Signal discovery, falls about 3 miles west of the main area of Mountain View field and 3 miles south of Union Avenue field.

Additional drilling will be needed to tell the significance of the well.

Canadians Ask Import Tariff

. . . on oil-field equipment. Manufacturers start drive to capture more than half of $236-million annual business.

A GROUP of Canadian manufacturers thinks a tariff on imports would help them get a larger share of the oil field-equipment business.

Twenty-five companies, most of them located in western Canada, told the Tariff Board at recent hearings in Calgary they do not expect protective tariffs or restrictive import quotas.

They suggested a modest tariff to place their production on equal competitive footing with imports.

"The employment possibilities which result from creating a major oil equipment manufacturing industry in Canada are most encouraging," the group said.

"With total imports at $236 million annually, there is no reason why . . . Canadian industry could not eventually acquire 60% of the oil-field item market, if aided by application of a tariff," they said.

They said goods which could be produced in Canada in the near future include oil and gas wellheads and fittings, downhole cementing equipment, floating equipment, drill collars, drill pipe, drill pipe tool joints, fishing tools, fluid and parts for slush pumps and pumping units, well packers, downhole pumps and drilling rig masts.

A warning against action that might increase costs to the petroleum industry was contained in separate reports made to the Tariff Board by Canadian Petroleum Association, British American Oil Co. and Imperial Oil.

The general attitude in the petroleum industry was summed up in the CPA brief:

"We would not object to a nominal increase in tariffs as they apply to the petroleum industry in any instances where it is established that the domestic market has demonstrated the immediate ability to supply comparable types of articles of a similar price, quality and service. In fact, where such Canadian market situations exist and where the manufactured costs contribute significantly to the Canadian economy, the industry subscribes to the policy of 'buy Canadian.' "

Several officials of companies signing the tariff request are representatives of the Oil Equipment Manufacturers Tariff Committee, chairmaned by E. M. Blanchard, president of Alberta Oil Tool Co.

Blanchard said a committee may be set up through cooperation of the CPA, Canadian Association of Oilwell Drilling Contractors, and manufacturers to investigate specifically what equipment can be made economically in Canada.

Humble Spuds Test at Grays Harbor on Sunshine Farmout

GRAYS Harbor County, Washington, is back in the exploration news.

Humble Oil & Refining last week spudded a 5,000-ft. wildcat in the Aloha area on acreage farmed out from Sunshine Mining Co. Sunshine put Washington in the oil producing column in 1957 but has had no luck in confirming its discovery.

The wildcat gives Humble a working interest in Sunshine's Washington acreage.

Humble's Allar-State No. 1 is located in Sec. 2-20n-12w about 2 miles north of Sunshine's 1 Medina in Sec. 15-18n-12w. The Medina well come in as a 223-bbl. wildcat in August 1957 but now is making only a few barrels a day.

Several wells have been drilled since the 1 Medina, but none has been a commercial oil well.

The Humble wildcat apparently will be shooting for the Nye (lower Miocene) sands, which produce in the 1 Medina at 3,940-63 ft.

Humble has been core drilling in both Washington and Oregon in recent months, but the Grays Harbor well is the company's only current active operation in the two states.

How Venezuela Sees Its Oil Future

• Perez Alfonzo draws gloomy picture for investors who hope for government encouragement. Minister tells industry it can increase oil activity now by exploring undeveloped concessions and improve profits by hiking oil prices.

WHEN Venezuela's Minister of Mines and Hydrocarbons paints a picture of oil's future in his country, he doesn't offer private investors much hope of any government action that would encourage further investment.

In fact, he says in so many words that the oil industry can increase activity in Venezuela by exploring the territory it now has and it can improve its own profit picture by raising the price of oil.

Dr. Juan Pablo Perez Alfonzo sketched his—and Venezuela's—oil philosophy in some detailed answers to questions posed by Dr. Oscar Irizarry, publisher of Petroleo Interamericano, the Journal's bilingual sister publication. The detailed questions and answers will appear in the July issue of Petroleo Interamericano.

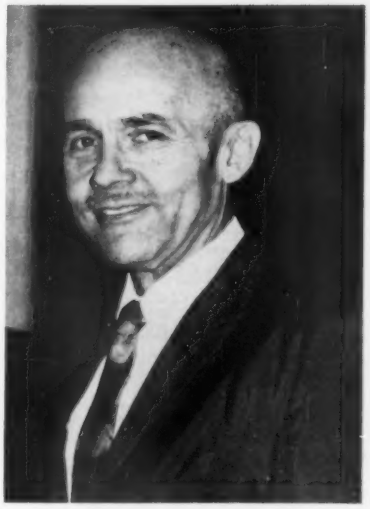
Just a short time after the oil minister presented his detailed views, he had to defend, from his own people, about the only encouraging thing he has to offer the private oil industry—no further taxation.

Dr. Perez Alfonzo went before the Venezuelan Chamber of Deputies in Caracas in an extraordinary appearance to try and kill an excess-profits tax on oil which was submitted by his own political party, Accion Democratica (OGJ, June 12, Page 100).

Here, in brief, is Perez Alfonzo's blueprint for the future in Venezuelan oil:

. . . **Nationalization** of Venezuela's oil is not considered by anyone in the country, even those he calls "extremists."

. . . **No further taxation** on oil is planned. It was this principle that Perez Alfonzo had to fight for in the first closed-door session of the Chamber of Deputies in 25 years.



Perez Alfonzo
". . . defending nation's interests . . ."

. . . **No new concessions** will be granted because this would just add to what he calls the "overexpansion" of the industry.

. . . **No mixed-capital operations** with private companies and the new national oil company are planned in lieu of new concessions. These, too, would add to unnecessary overexpansion.

. . . **All the incentive** private industry needs to expand in Venezuela already exists in large tracts of undeveloped concessions with long terms to run.

. . . **The new national company,** which is now drilling its first well on semi-proved acreage, will grow "slowly" and will not "take away any of the markets or customers" now served by private companies.

. . . **U. S. import restrictions** are helping depress the Venezuelan oil industry. The oil minister says his quarrel is not so much with the system of restrictions as it is with the way in which it is applied. He says he hopes to persuade President Kennedy to make changes.

On nationalization . . . Perez Alfonzo scoffs at even a remote possibility of nationalization of oil in Venezuela.

The country has so much oil, he says, that production could not be limited to Venezuelan demand. The country has to export and export in large quantities. The easiest way for Venezuela to maintain these necessary large oil exports is through the international companies which have established markets.

Perez Alfonzo says he can understand investors, interested in protecting capital, are "timorous" and therefore "somewhat unreasonable." Confiscation in other parts of the world naturally makes the investors apprehensive at the "adjustments" Venezuela has made in raising oil's taxes.

"In the long run they will come to understand that we are rightfully trying to defend the nation's interests by obtaining an adequate participation in the profits of the industry and not trying to do away with foreign investments through expropriation," he says.

On higher taxes . . . The oil minister cites his own statements and those of President Romulo Betancourt to assure the industry that the "government recognizes it is unreasonable to increase further the oil companies' present tax load."

In spite of the fact that both Perez Alfonzo and Betancourt are leaders in Accion Democratica, this stand on oil taxation is not universally accepted either by AD or by other Venezuelan political parties.

To support his "no-more-taxes" philosophy, Perez Alfonzo concedes

that Venezuelans want to get "all we can" out of their oil, but says he is aware they cannot make demands beyond limits that will "deprive companies of a just compensation for their investment."

Since risks are greater in a foreign country than at home, he believes private companies operating in Venezuela are entitled to a higher profit than in "the United States and Canada."

"But, not as much as they became accustomed to make under those government administrations which neglected to defend the nation's oil resources."

New concessions . . . The oil minister shrugs off any discussion of the regime's policy of granting no more concessions as being tiresome.

He contends now, as he always has, that there is no need for Venezuela to grant any new oil concessions—that companies operating in the country have fully explored only one-tenth of the acreage which they now have under concession.

He describes the most recently granted concessions in 1956-57 as "foolhardy" and blames the new land grants "in part" for what he calls the "current market dislocations" and lower oil prices.

"Only short-sightedness prompted by fear can lead to the belief that granting new concessions under the present market conditions can strengthen the industry."

Mixed-capital contracts . . . Perez Alfonzo points out that the law which created the new national oil company would allow Venezuelan Petroleum Corp. (CVP), to make contracts with private investors and companies to develop new oil areas in Venezuela. He says these provisions of the law give Venezuela a new method of finding and producing its oil, but says it would be just as foolish to create mixed-capital ventures now as it would be to grant new concessions.

Incentive to the industry . . . Past remarks by President Betancourt, indicating the possibility of some government action to give the more heavily-taxed private industry some added incentive, are sidestepped by Perez Alfonzo.

He believes "vast company-held" tracts of land in Venezuela that he says have been unexplored offer the industry ample incentive for exploratory investment.

With 23 years to run on many of these concessions, Perez Alfonzo says there is ample time to do all the work needed in the old concession areas.

CVP a competitor? . . . The oil minister says his new national company is just starting and has no need to begin producing on a large scale immediately. When it does, he says, it will supply part of the gradual increase in world demand without displacing any markets now served by private companies.

The rapid growth of energy consumption in the world offers room for everyone, CVP and private companies alike. He does not, however, give any details on how or where CVP plans to market its production.

U. S. import controls . . . Perez Alfonzo cites the resolution passed in January by the newly formed Organization of Petroleum Exporting Countries (OPEC) to illustrate his stand on the U. S. import restrictions. In brief, that resolution decried setting import restrictions or allocation without first consulting the exporting countries.

He complains that the U. S. system has never fulfilled its objective, which he says is to protect prices both in the U. S. and internationally.

His harshest language is reserved for the practice of U. S. importers "trading" permits. He says this "windfall" has demoralized price schedules both in the U. S. and abroad.

Italy-Germany Line to Start

ANOTHER of Enrico Mattei's dreams will start turning into reality this month when an oil pipeline spread starts working northward from Genoa toward the Alps.

The aggressive head of Italy's ENI for years has pressed for a big-inch system originating at the Italian port. The line will carry crude to an ENI refinery in Switzerland. And, Mattei insists, spreads will keep right on moving into Germany—moves by his international competitors notwithstanding.

Another branch will be built into Italy's Po Valley later.

The first leg will be laid to Ferrera, Pavia Province, where the main pumping station will be located. One branch will then extend northwestward to a refinery at Aigle, Switzerland.

ENI has one-third interest in a 40,000-bbl. refinery under construction at Aigle.

A second branch will extend northeastward across Switzerland to refineries in Germany at Stoccarda, north of Munich, and at Ingolstadt.

Design capacity of the system will be 240,000 bbl. daily, with up to 80,000 bbl. moving through the Aigle branch and 160,000 bbl. through the German section.

Mattei's proposal for an ENI system into eastern Germany spurred its rivals to speed plans for refinery construction in Bavaria. Esso, British Petroleum, Shell, Mobil, and local refiners have set up Karlsruhe-Bayern Olleitung for the purpose of building a 24-in. extension of the Marseille-Karlsruhe pipeline into the area (OGJ, Oct. 24, p. 189).

ENI has not disclosed the diameters of line planned for its system.

FOREIGN

Refinery expansions have been completed at two BP Group refineries. Societe Francaise des Petroles BP raised throughput capacity from 46,000 to 58,000 bbl. a day at its Dunkirk, France, refinery by adaptation of existing equipment. An Edeleanu dewaxing unit with a capacity of 2,000 bbl. daily has been completed at the Neuhof Lubricants refinery of Oelwerke Julius Schindler G.m.b.H. near Hamburg, Germany.

Two test wells are planned by Tradewinds Exploration at sites in the south-central part of the East Indies island of Timor. The first will be an offset of Matai No. 1 drilled earlier this year. Heavy water flow at 2,027 ft. on the first well prevented a test of oil found at 800-1,000 ft. The other new test

Ceylon Moves Toward Partial Nationalization

- **Government will "requisition" facilities it needs to set up a state company with 25% of the oil-product market.**

CEYLON has decided to take over some of its privately owned oil facilities through a process of "nationalization by nibble."

Aim of the move: To get a new government oil company off the ground.

Supplies for this company are expected to come from Russia, but the Ceylonese Government needs storage and distribution facilities.

A bill that sets up the Ceylon Petroleum Corp. allows the government to requisition facilities from private companies. Compensation will be determined by local courts. Caltex, Stanvac, Royal Dutch-Shell, and British Petroleum market on the island.

The nibbling approach—also used by Indonesia last year—is a lot more sophisticated than the outright nationalization which created turmoil and a breakdown in operations in Mexico and Iran.

Nibbling doesn't wreck a facade of good relations between a government and the companies which are being separated from some of their properties.

But if the practice spreads to other countries, operators face another big headache.

Here's what is happening in Ceylon:

The bill setting up the new oil company has been passed by both houses of Parliament. Only formal, routine approval by the governor general is needed.

Passage was a foregone conclusion, since all of the island's main parties approved it before final debate. Protests from oil companies and objections on a diplomatic level were ignored.

The state company is expected to be in business within 6 months.

Actually, the amount of business that will be involved in the "nibbling" is relatively small.

The bill assures the state company of 25% of the local market for petroleum products.

An offer of cheap products from Russia spurred the introduction of the measure (OGJ, May 15, p. 118).

The law also will ease the local oil business into state-controlled prices. Ironically, government-established maximum and minimum prices are being prompted by fears that established marketers will undercut the state organization.

As a further insurance against private competition, the state company will be exempt from income taxes.

The government, however, is not combining its partial takeover with the recriminations that in the past have often gone along with nationalization. Instead, it is assuring marketers they have nothing more to fear, so long as they are content to settle for 75% of existing sales.

Indonesian move . . . Nationalization of just a piece of the industry took place in Indonesia last year when the government took over the entire interest of Permindo, a producing company it owned jointly with Royal Dutch-Shell.

The government and Shell had owned Permindo on a 50-50 basis until the government arbitrarily decided to acquire 100%. The government is now operator and sole owner of Permindo's output of about 27,800 bbl. daily.

Shell produces another 88,000 bbl. daily in Indonesia through a solely owned subsidiary.

BRIEFS . . .

will be in the Debos section, 2 miles from the Matai wells.

Costa Rica's first refinery may be built by Texaco, which has offered to build a 5,000-bbl. plant at Puerto Limon. If the refinery is approved, it will supply the local market. Crude supplies will probably come from Venezuela.

Small amounts of crude are being recovered from shallow wells on northern Cebu, drilled by American Asiatic Oil Corp., a local Philippines company. The firm, using two 1,000-ft. rigs, has encountered pressure zones from the "grass roots" down in the Daan Bantayan region of the Maya prospect. One well yielded 20 bbl. of 45.6°-gravity crude from 234 ft. Crude from another well, which had a small blow out several weeks ago, has been test refined at Stanvac's Bataan refinery.

Singapore's first refinery will be put on stream this month by Royal Dutch-Shell. The 20,000-bbl. plant, on Pulau Bukom, will supply the company's local markets for principal products.

The corporate name of Esso Export Corp. has been changed to Esso International, Inc. A company announcement said the switch reflects more accurately the widespread operations being carried on.

Russia will soon start building tankers capable of hauling 45,000 tons — about 330,000 bbl. — of crude, and has plans for a ship that will carry 75,000 tons. Biggest Russian tankers now are three 40,000-ton "Peking" class vessels, each with a capacity of 27,000 tons of oil. A fourth ship in this class is being readied for service.

A 10,000-bbl. combination coker and distillation unit will be opened in the fall of 1962 by Gerwerkschaft Erdoel at its 53,000-bbl. refinery at Lingen, Germany. The unit will operate on domestic crude, which is being produced in increasing amounts from nearby Emsland oil fields. In addition to coke, the unit will produce middle distillates and motor gasoline.

A 35-million-lb. annually phthalic anhydride plant will be built at Hull, England, by California Chemical Co. and Grange Chemicals Ltd. The California Standard subsidiary will have one-third interest. Grange, owned jointly by British Hydrocarbon Chemicals and Cal Chemical, will have two-thirds. Badger Ltd. has the design and construction contract.

Europeans Push Octanes Up

- **Difference between U. S., European gasolines being whittled fast. Widest gap is between regular grades.**

EUROPEAN REFINERS are adding octanes at a rate that is closing the gap between their own and U. S. gasolines.

Premium sold at many European pumps has equaled its U. S. counterpart for some time. But research octane ratings of premium in countries checked by Associated Ethyl Co., Ltd., still are generally on the way up. This is especially true of minimum octanes.

There is a wider difference between European and U. S. regular grades. However, this has narrowed considerably.

In Norway, regular octanes have gone up several points and now range from 83 to 90. Last year, they varied from 79 to 84.

U. S. octanes, in contrast, have leveled off in the past year. The average RON in May for premium was 99.3, off 0.1 number from a year ago. Regular averaged 92.6, up 0.1 number above May 1960.

How European Octane Picture Is Changing

	Premium		Regular	
	1960	1961	1960	1961
Western Germany	97-101	98-101	88-92	90-93
Switzerland	94-100	98-100	87-91	90-92
Sweden	96- 98	96- 98	88-90	87-90
Norway	93- 95	93- 97	79-84	83-90
Finland	94- 95	94- 95	87-88	87-88
Belgium	94- 97	94- 97	85-88	85-88
Netherlands	93- 95	94- 95	84-86	84-88
France	92- 94	93- 95	82-85	85-87
Italy	98-100	98-100	84-86	84-87
Denmark	95- 97	95- 97	83-86	83-87
Austria	93- 97	95- 98	82-87	84-86
Great Britain	95-101	95-101	82-86	83-84
Spain	93	92- 94	82-83	82-84

Goal for Karachuk: 40,000 Bbl. Daily

SYRIA has started turning the wheels of a development program that will put Karachuk oil field on commercial production in 3 years.

Bids have already been asked for drilling and field facility projects, and tenders will be invited July 1 for a $36.4-million pipeline outlet.

Here is what is planned, as disclosed by Wajih al-Samman, Syrian minister of industry:

. . . Twenty oil wells at Karachuk, and three gas wells, at al-Jubaisah, al-Ghaunah, and al-Baibah will be drilled. The winner among five bidding companies is expected by the end of June.

. . . About seven 50,000-bbl. crude storage tanks will be built at the field. Bidding will close July 1.

. . . A 435-mile pipeline will be built to the Mediterranean port of Tartus. The project includes pumping stations.

. . . Syrian General Petroleum Co. will be set up to operate the field, which is scheduled to open in July 1964. Initial production goal of the new company is believed to be 40,000 bbl. daily.

Two-thirds of Syrian General Petroleum will be held by the state-owned Economic Development Organization. The remaining third will be offered to the public.

Karachuk, located in northeast Syria, was discovered 5 years ago by a Syrian-born American independent, J. W. Men Hall, who later brought Atlantic Refining and Portsmouth Steel into the venture as partners. The rights were cancelled and physical assets taken over by United Arab Republic in 1958.

German field . . . Syria and Deutsche Erdol AG have reached an agreement for the joint development of the German company's Suwaidiyah oil field.

The Economic Development Organization will form Gezira Oil Co., with joint public and private Syrian financing. Gezira Oil will then form a partnership with Soc. des Petroles Concordia, the Deutsche Erdol subsidiary operating in the country.

Suit prompts move to end Jersey-ENI refining activities

JERSEY Standard and ENI are coming to a parting of the ways in their joint refining operations in Italy.

ANIC, a member of the ENI group, has initiated liquidation proceedings which will break up the jointly-owned Stanic Industria Petrolifera SPA. Stanic operates a 49,000-bbl refinery at Bari, and a 47,000-bbl. plant at Leghorn.

The move was made in the wake of a $41-million lawsuit by ANIC and another Italian company against Jersey and Esso Research & Engineering Co. The suit charges breach of contract in the construction of a Powerformer at Bari and a Hydroformer at Leghorn (OGJ, May 1, p. 83).

Jersey, opposed to the breakup, said it does not believe the move is in the interest of Stanic, the Italian economy, or of the two parent companies.

Argentina Okays Oil Bids

CONTINENTAL Oil and Ohio Oil may soon win drilling rights in Argentina after 2 years of delay.

The YPF Board of Directors has approved identical bids by each of the companies for exploration and development rights on adjoining areas in northern Argentina. No date was set for signing the pacts.

The area involved covers nearly 15 million acres in Tucuman and Santiago del Estero provinces. The bids were approved twice before, but signing was delayed because of changes on the YPF Board and local political conditions.

The agreement would be in line with YPF's continuing drive to expand production. Bids are being called this month for development in Neuquen and Mendoza provinces.

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because Mission Super-Chrome rods have 2 wearing surfaces

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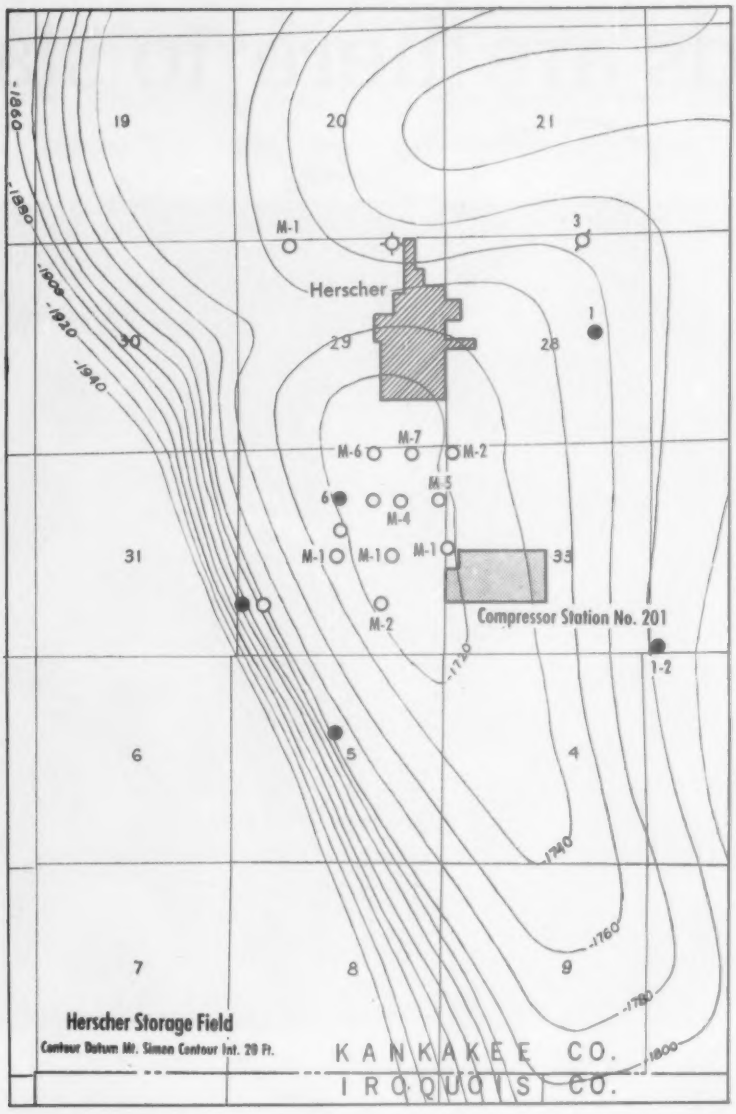
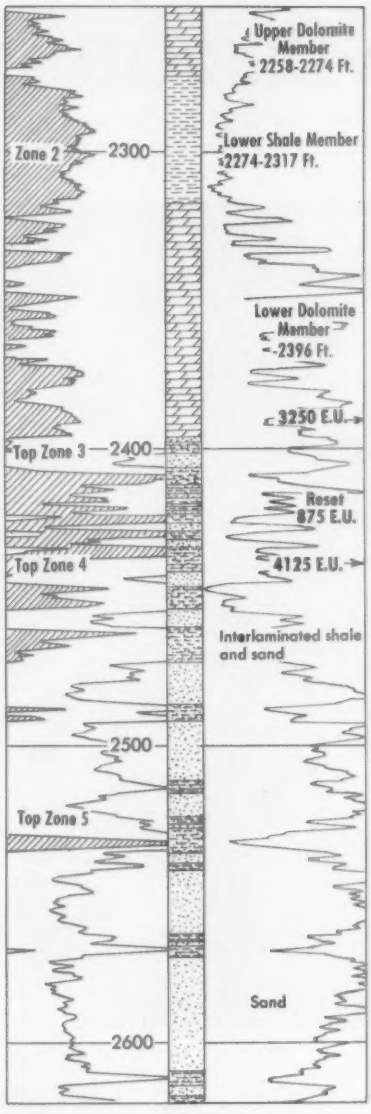


STRUCTURE MAP of Herscher field, Illinois. Contours are on top of the Mount Simon formation. Fig. 1.



GAMMA-RAY NEUTRON LOG of the Mount Simon reservoir as taken in the No. 6 Karcher, with lithologic descriptions added. Fig. 2.

How the Mount Simon gas-storage

• Continued need for gas-storage capacity in the Chicago area led to the development of the Mount Simon gas-storage reservoir, Herscher field, Illinois. Here's how the reservoir was put into operation, from first investigation to full-scale use.

By **WALTER M. RZEPCZYNSKI**
Natural Gas Storage Co. of Illinois, Chicago
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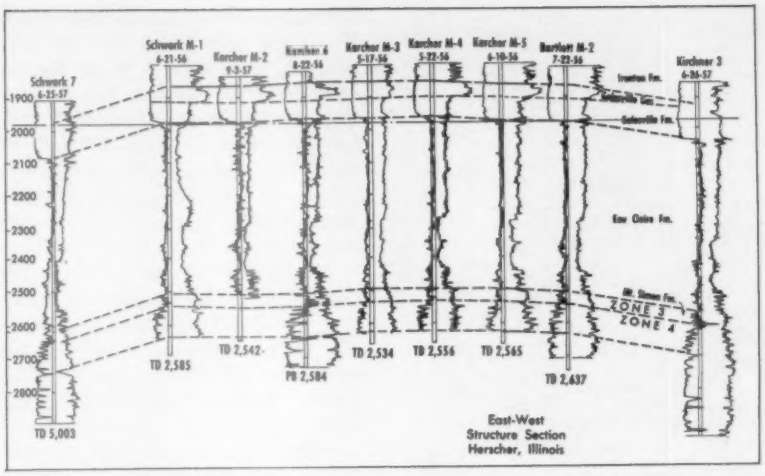
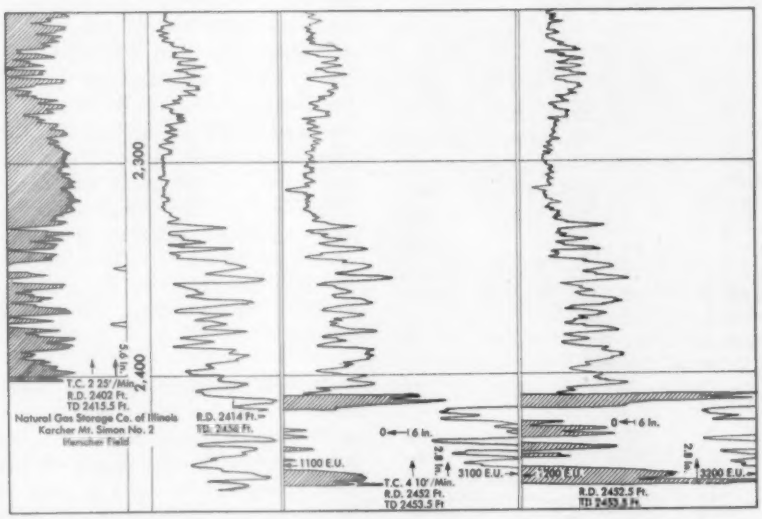
THE MOUNT SIMON formation of Herscher field, Illinois, underlies the Galesville reservoir, completed earlier as a gas-storage aquifer. When the Galesville was being developed, one well, 6 Karcher, was drilled to the Mount Simon. It was to be used as an observation well, to see if pressure changes in the Galesville were reflected by changes in the Mount Simon. Data from



EAST-WEST CROSS-SECTION of Herscher field showing the Galesville and the Mount Simon reservoirs. Fig. 3.



COMPARISON OF SUCCESSIVE NEUTRON LOGS of 2 Karcher showing how gas saturation changes with injection in the Mount Simon reservoir. Fig. 4.

project was developed

this well would show whether or not the Galesville was isolated from the formations lying at greater depths.

No communication. The tests were satisfactory, and the fluid level in 6 Karcher remained almost constant in spite of changes in Galesville pressure.

At this point, some thought was given to the Mount Simon as a possible storage reservoir itself.

The Mount Simon formation at Herscher is about 2,500 ft. thick. It is an alternating sequence of fine-grained to coarse, granule-bearing sandstones of pure quartzite with a few thin shales of varying thickness, Figs. 1, 2, and 3.

The stratigraphic column shows several zones. Zone 2 is made up of shale and dolomite and serves as the cap rock for the reservoir. Zone 3 is a mixture of thin shales and sands of low permeability. Zone 4 is the first section that could be used for gas storage. Underlying it is zone 5 which is a clean sand of high permeability with occasional shale streaks.

Zones 4 and 5 were the ones chosen to make up the reservoir. Closure, based on the Galesville structure, was sufficient to form a trap with a large capacity for gas storage.

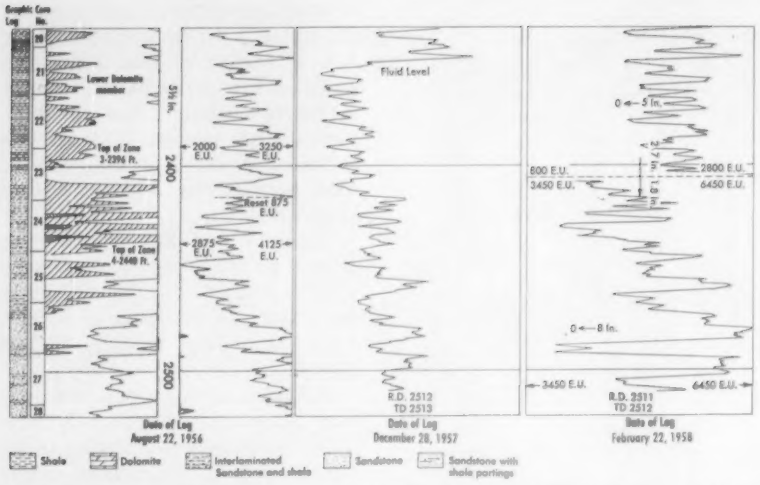
A series of water pumping tests was made on 6 Karcher in June 1957 to obtain some measure of the permeability of the Mount Simon away from the well bore. This would indicate future performance of the sands when gas was injected into the reservoir. These tests showed a permeability of the sand around 200 md. which was greater by a factor of four over the average core-analysis value of 53 md.

Further investigation of the Mount Simon formation was made possible when it was decided to drill water-withdrawal wells on the periphery of the Galesville gas bubble. These wells were drilled first into the Mount Simon formation and cores were cut of the cap rock and upper sand. The wells were later plugged back for use as water withdrawal from the Galesville formation. The logs and core analyses on these wells showed that the Mount Simon structure parallels the Galesville and provided enough other information to permit the development of the Mount Simon for storage.

Reservoir capacity. The top reservoir pressure was chosen at 1,260 psia., a value of 200 psi. above the original aquifer pressure. This corresponds to raising the pressure gradient from 0.443 to 0.525 psi. per ft. This is a conservative top pressure since gas-storage fields have been operated up to 0.65 psi. per ft. of depth.

Porosities of core specimens on four wells were averaged for zone 4 and found to be 14.8%. A value of 30% residual water content was estimated as an appropriate value after sufficient time had elapsed for proper drainage.

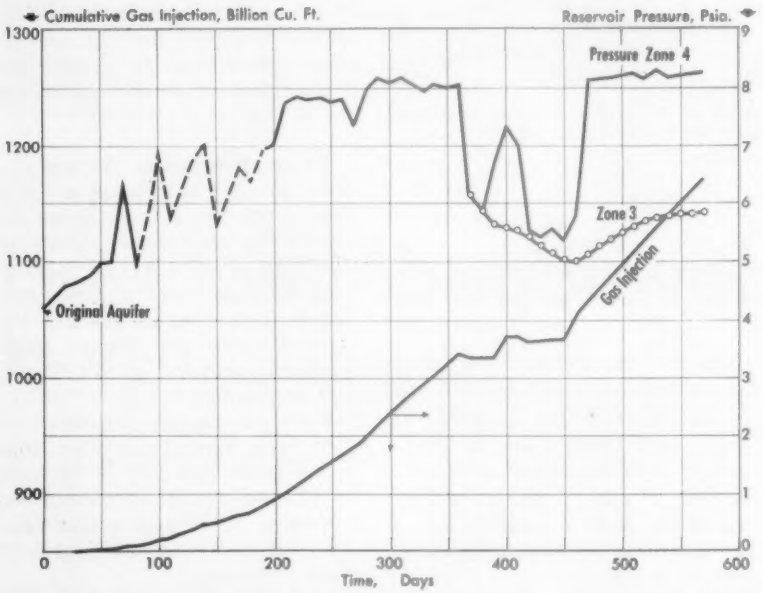
Volume of the sand body is fixed by the structure of the cap rock



COMPARISON OF NEUTRON LOGS of 6 Karcher showing changes of gas saturation before and after gas injection into this well. Fig. 5.

TABLE 1—CALCULATION OF GAS-STORAGE CONTENT FOR MOUNT SIMON (Zone 4)

Equiv. Subsea Depth of Storage Reser. at Karcher No. 6	Contour Area (Gr. Acres)	Acre-Feet Within Contour Interval	Cumu'l Acre-Feet	Gas Content Billion Cu. Ft. Cumu'l Gas Content (1,260 psia.)	700 psia.	500 psia.
-1763 (Top of zone 4)						
-1764	150.5	255.9	255.9	0.118		
-1774	474.5	3,125.0	3,380.9	1.564		
-1784	956.7	7,159.0	10,539.9	4.845		
-1794	1,397.3	11,770.0	22,309.9	10.210		
-1804	2,011.8	16,646.8	38,956.7	17.810		
-1814	2,756.6	23,842.0	62,798.7	28.720	16.410	11.380
-1824	3,337.1	30,468.5	93,267.2	42.650	24.390	16.890
-1834	3,964.9	36,510.0	129,777.2	59.400		
-1844	4,603.7	42,843.0	172,620.2	79.000		
-1854	5,306.4	49,550.5	222,170.7	101.800		



RECORD OF RESERVOIR PRESSURE CHANGES with amount of gas injected, both as a function of time. Fig. 6.

and the lowest operating water level above the spill point. It was first thought that zone 3 must be included in the reservoir but present information shows that zone 3 may be isolated from zone 4. Table 1 shows the gas-storage content for various bubble bottom depths assuming 30% residual water saturation.

The volume of gas which can be contained in the reservoir is more than 50 billion cubic feet. However, the rate at which the bubble can be generated at the 200-psi. rise in bubble pressure over the initial aquifer is the controlling factor.

When first considering the reservoir, calculations were made using the constant-pressure unsteady-state aquifer formula. For a pressure differential between the gas bubble and initial aquifer of 100 psi. and employing a thickness value of 400 ft. for the sand (radius of bubble 2,000 ft., $c=2.9 \times 10^6$, Phi=14.8%, and K=180 md), a gas-injection rate of 9 M.M.c.f.d. was calculated at the end of 200 days. For the 200-psi. differential now used, the rate would have been 18M.M.c.f.d. This prediction is in fair agreement with field performance even though the use of 400 ft. of sand thickness was questionable in view of the many thin shale layers.

Drilling, completion, and injection. The M-2 Karcher was drilled and completed with 5½-in. casing set at 2,409 ft., the depth of the first appearance of sand in zone 3. This well was then deepened open hole to 2,454 ft. The original well drilled to the Mount Simon, the 6 Karcher was first used as an observation well and later put in use as a production well. It was completed 55 ft. lower than the M-2 Karcher.

First injection into the M-2 Karcher was on November 29, 1957, at average daily rates varying from 0.8 to 1.2 M.M.c.f. Care was exercised in displacing the water from the casing. Gas-injection pressures were held at 100 psi. above the original aquifer pressure.

On December 16, 1957, after having injected approximately 9.7 M.M.c.f. of gas into the reservoir, the 6 Karcher well located 670 ft. away had the first appearance of gas in the well bore. By December

17, the well had a wellhead pressure of 230 psig. and on the morning of December 19 the wellhead pressure rose to 816.9 psig. On December 26, the 6 Karcher reached a wellhead shut-in pressure of 1,008.7 psig. as compared to an injection pressure of approximately 1,040 psig. at M-2 Karcher. At this time about 20 M.M.c.f. of gas had been injected into the reservoir.

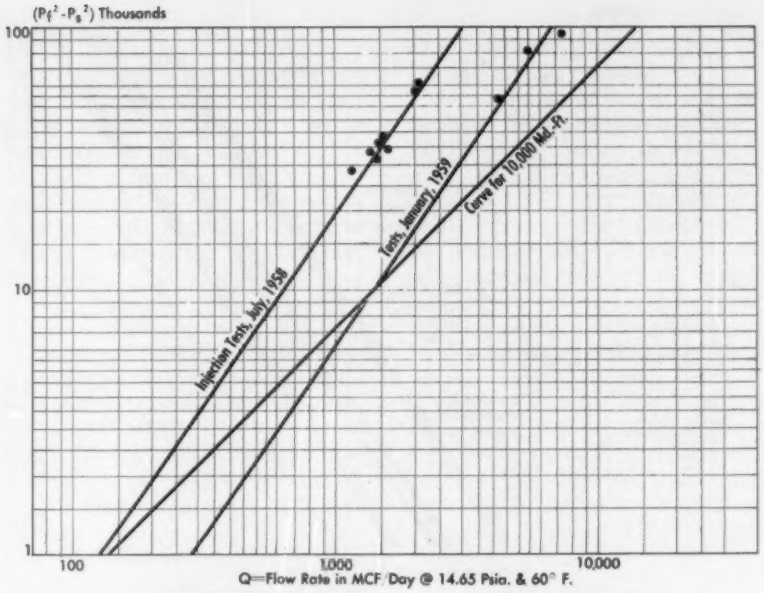
To find the thickness of the gas zone when gas reached 6 Karcher, the volume of injected gas when converted to reservoir conditions may be assumed to occur in a layer 670 ft. in radius. Calculations show that the gas zone had a total thickness of 1 ft. if the pore space were 50% saturated with gas.

Fig. 4 shows gamma ray-neutron run in M-2 Karcher before and after gas injection into this well. Note that the logs obtained on January 7 and February 22, 1958, indicate a drying of the wet sands at the base of the casing and at the bottom of the well. Also, the intermediate sands between the most pronounced kicks show varying degrees of drying in less-developed intervals of sand thickness.

Fig. 5 compares gamma ray-neutron logs of 6 Karcher gas observation well before injection into the reservoir and after gas fingered into this well. It shows that there is some gas saturation just below the casing point. Also shown is a log obtained after gas was injected into the well. This log, likewise, indicates a drying of the wet sands at the top and bottom of the same interval of sand as exposed in the M-2 Karcher. In addition, sands below 2,454 to 2,512 ft. which is not exposed in M-2 Karcher may be indicative of the higher (factor of 3) injection volumes into the 6 Karcher as compared to M-2 Karcher.

More wells. Ten additional gas production wells were drilled and completed from April to September 1958, with 7-in. casing set through the entire storage interval at approximately 2,570 ft.

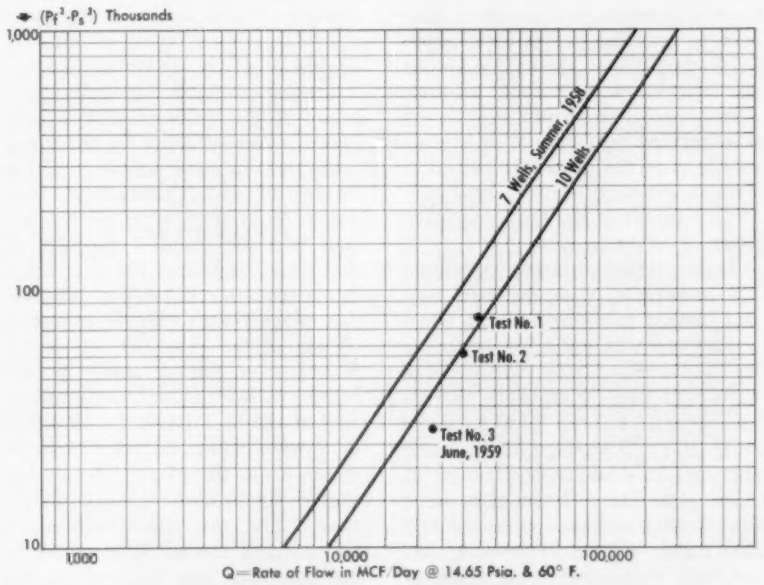
In the meantime it had been found that zone 3 was not taking gas at the rate originally expected. Because of this, it was decided to isolate zone 3 and complete all of the 10 wells in the upper part of zone 4. These wells were selectively perforated in the best sands in the zone, but the results were disappointing. The wells were later perforated through the entire length of zone 4, resulting in greater flow capacities and allowing the entire interval to be exposed to injected gas.



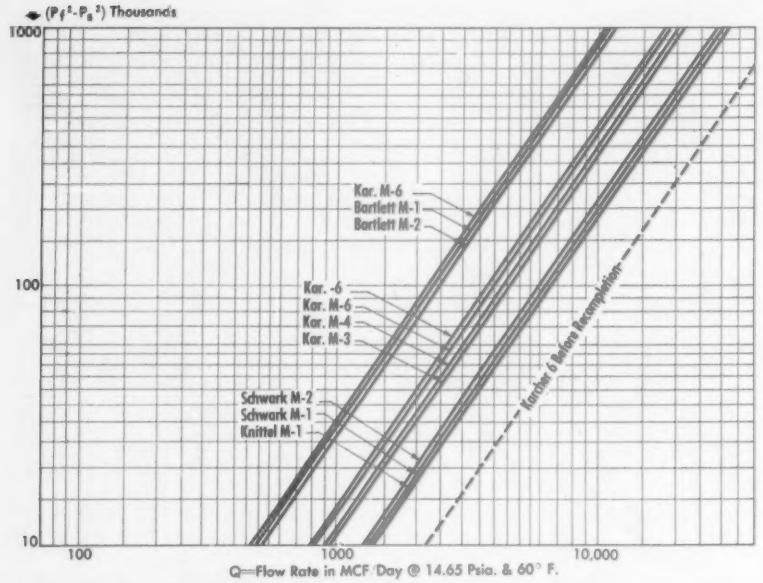
PERFORMANCE CURVES for M-1 Knittel. Fig. 7.

By November 1958, results obtained from the completion of the majority of the production wells brought about the recompletion of the 6 Karcher and M-2 Karcher. The 6 Karcher was recompleted by casing off the trashy zone 3 and then reperforating in the same interval in the upper zone 4 as the majority of the production wells. The M-2 Karcher was recompleted by setting casing through the previously exposed open section and perforating only in zone 3. This well has since been used as a gas observation well to observe pressure responses in zone 3 from the underlying active zone 4.

In addition to the production wells, three observation wells were



FIELD PERFORMANCE CURVES for the entire Mount Simon reservoir. Fig. 8.



INDIVIDUAL WELL-PERFORMANCE CURVES, Mount Simon reservoir. **Fig. 9.**

drilled and completed into the Mount Simon aquifer some distance away from the immediate gas-bubble area, in relatively the same interval of sand that gas is being injected into on the crest of the structure. These three wells, the 1 Heimburger, 2 Wadleigh, and M-1 Dickman will allow observation of pressurization of sands away from the gas-bubble area.

Field operation. The wells were connected with a field booster station by 12 and 8-in. lines. The 1,320-hp. station raised the gas from line pressure of around 650 psig. to injection pressures of about 1,190 psig. Fig. 6 shows cumulative gas injection and reservoir pressure versus time. For several months gas was injected into both wells during which time the reservoir pressures were computed. After June 17, 1958, the M-2 Karcher was used as an observation well.

Injection rates started at around 1.4 M.M.c.f.d. with the first well and jumped to 6.0 M.M.c.f.d. when 6 Karcher was used for injection. By September 1958 when seven wells had been completed, the injection rate was 18 M.M.c.f.d. In June 1957, 23 M.M.c.f.d. was being accepted at a reservoir pressure of 1,260 psia. The differential between the flowing wellhead pressure and the static wellhead pressure has gradually decreased to a value of 11 psi., indicating increased permeability around the well bore due to drying of the sand.

To test the Mount Simon reservoir, gas was withdrawn during the winter of 1958 - 59 during three separate tests with a total withdrawal of 252,508 M.c.f. Test 1 was conducted from 1:25 p. m., December 1, to 9:15 a. m., December 5, 1958, with a total volume of 80,421 M.c.f. being withdrawn. Test 2 was conducted from 7:53 a. m., January 6, to 3:55 p. m., January 9, 1959, with a total volume of 94,570 M.c.f. being withdrawn. Test 3 was conducted from 11:28 a. m., January 19, to 10:15 a. m., January 22, with a total volume of 77,517 M.c.f. being withdrawn.

During each of the three tests, many of the wells on flow experienced some difficulty in operation; either due to mechanical malfunctioning or water production. Periphery wells that were on production had the greatest problem of water encroachment and were shut-in shortly after test began. The appearance of water was not expected, as gas in the reservoir was insufficient to create a stable bubble bottom below the well perforations. In fact the M-1 Bartlett well which is downstructure partially went to water while the Mount Simon was shut in during the first week of February. The mechanical difficulties encountered during flow could be attributed to gas hydrates in the regulators and failure of the alcohol injector pumps to prevent hydrates with the wellhead arrangement.

Peak day withdrawals for tests 1, 2, and 3 were 25,342, 32,951, and 31,371 M.c.f. respectively. Individual flow rates of various wells varied between 1.2 and 7.2 M.M.c.f. per day at drawdowns from 11 to 50 psi.

Pressures in the gas bubble are relatively uniform, indicating good communication between wells. Table 2 gives closed wellhead pressure on March 9, 1959; gas was injected up to March 6 and started again late on March 9. The pressures on March 11 are also reported showing both closed-in and flowing pressures.

Well-flow capacities. Permeability data from cores and pumping tests were used to evaluate flow capacities of the wells. The chart of flow per millidarcy-foot versus $P^2_f - P^2_s$ was used along with the expected capacity of completed wells. For example, a well with 46 ft. of effective perforations was predicted to produce 14.5 M.M.c.f. per day with a 50 psi. drawdown from 1,183 psia. in the reservoir.

During gas injection in the summer of 1958, careful measurements of individual well flow rates and injection pressures were made. These flow data were used to give individual well-performance curves and a composite field curve.

Fig. 7 shows performance tests on the M-1 Knittel well. The well was completed and put in operation on June 25, 1958, and the injection tests were started on June 28 and

TABLE 2—WELLHEAD PRESSURES ON MOUNT SIMON WELLS

Well	Wellhead pressures, Psig. 3/9 All Closed	3/11
M-1 Bartlett	1,119.9	1,162.9
M-2 Bartlett	1,117.7	1,166.3
M-2 Karcher	1,019.4	1,020.7*
M-3 Karcher	1,121.4	1,165.3
M-4 Karcher	1,122.9	1,165.8
M-5 Karcher	1,122.9	1,165.8
M-6 Karcher	1,117.7	1,166.2
M-7 Karcher	1,119.8	1,146.1*
M-1 Knittle	1,118.8	1,164.0
M-1 Schwark	1,120.5	1,164.3
M-2 Schwark	1,114.4	1,165.1
6 Karcher	1,122.2	1,165.5

* Closed, rest injecting, average injection rate March 10, 11 is 34 million cubic feet/day

lasted to July 24, 1958. Tests made in January show that it had improved over 100% in capacity due to the drying of the sand around the well bore. The slope corresponding to n=0.71 was taken from tests on the 6 Karcher and it appeared to agree with other well behavior. The performance curve based on 10,000 md.-ft. for 50 ft. of perforations in the M-1 Knittel is included on Fig. 7. The slope is close to 45° since no way has been found to predict well behavior with n values as low as 0.71.

The individual well tests of the seven wells were combined to give a field performance curve, Fig. 8. Again in January, individual well tests were made, Fig. 9, and the field performance was computed as shown on Table 3. These tests show that the 10 wells are about 10/7 as good as the seven wells in the summer of 1958. The loss in flow capacity when 6 Karcher was plugged back and recompleted is indicated by the two curves for the well on Fig. 9. It should be noted that the eighth and ninth wells, M-1 and M-2 Bartlett, were relatively poor, since they may not be dried even now. The improvement in the seven wells just offset the reduced capacity of the three wells added.

Another test point on June 20, 1959, shows further improvement in the field performance.

Communication in Zones 3 and 4. It will be recalled that only M-2 Karcher and 6 Karcher were opened to the sands in zone 3. In November 1958, M-2 Karcher was recompleted with perforations only in zone 3 so that its pressure observations reflect those of this trashy zone. Also 6 Karcher was recompleted in zone 4, with zone 3 cemented off. The pressures on zone 3 are plotted on Fig. 6; they differ from those in zone 4 by as much as 160 psi. A total of 186 M.M.c.f. of gas was injected into M-2 Karcher. It may be assumed that one-half of this gas entered zone 3. Likewise, 6 Karcher may have injected an equal amount, or a rough estimate of the gas in zone 3 is 186 M.M.c.f.

As of November 1958, no more gas was injected into zone 3. Since the gas bubble was at pressures above the original aquifer (1,060 psia.) water continued to be pushed out with a corresponding decrease in gas-bubble pressure. In early January when the zone 4 pressure rose, the rate of pressure decline for zone 3 flattened. This indicates transfer of gas from zone 4 to zone 3 (or possibly a pressurization of the zone 3 aquifer from zone 4 aquifer). By June 1959, the pressures in both zones have stabilized. This indicates a transfer of gas from zone 4 to zone 3 just sufficient to compensate for the water push-out.

If we assume no gas or water transfer during December and a gas content for zone 3 of 186 M.M. c.f. water movement rate in zone 3 becomes 2,790 cu. ft. per day or 31 cu. ft. per day per psi. difference between gas bubble and initial aquifer. Using this rate of water movement for June 1959, we get a transfer of 226,000 cu. ft. of gas per day from zone 4 to zone 3. In 300 days, 67.8 M.M.c.f. would be transferred. A production of this amount of gas from zone 3 each winter would keep this zone from filling with gas and permit using the shale zone at the top of zone 4 when considering the spill point for the gas-storage reservoir.

A calculation of the vertical permeability for the transfer of 226,000 cu. ft. of gas across the 2 ft. of shale with a pressure drop from 1,260 to 1,140 psia. using an area of 300 acres gives a value of 6×10^6 md. Granted the thickness may be larger and the area less, the permeability is still down to 10^4 md. the order of magnitude of values found in tests on cores at this level on 6 Karcher.

These predictions are based on the concept that the shale layer at the base of zone 3 is continuous over the gas bubble in zone 4 and out into the aquifer some distance, a condition indicated by the behavior observed.

TABLE 3—CALCULATION OF ACTUAL FIELD PERFORMANCE CURVE OF MOUNT SIMON RESERVOIR

	With. Test 1	Inj. Test 2	Inj. Test 3
Time	4:00 a.m.	8:00 a.m.	8:00 a.m.
Date	Jan. 7, 1959	Jan. 2, 1959	June 20, 1959
No. of wells	9	10	10
Shut-in pressure			
Wellhead, psig.	1,101.7	1,157.0	1,169.0
Reservoir, psia.	1,190.9	1,250.5	1,263.4
Flow pressure			
Wellhead, psig.	1,071.3	1,177.7	1,179.8
Reservoir, psia.	1,158.3	1,272.5	1,274.7
Q=flow rates, M.M.c.f.d.	34,896	30,260	23,064
Pf^2	1,418.2	1,563.8	1,596.2
Ps^2	1,341.7	1,619.3	1,624.9
(Pf^2-Ps^2)	76.5	55.5	28.7

Acknowledgment

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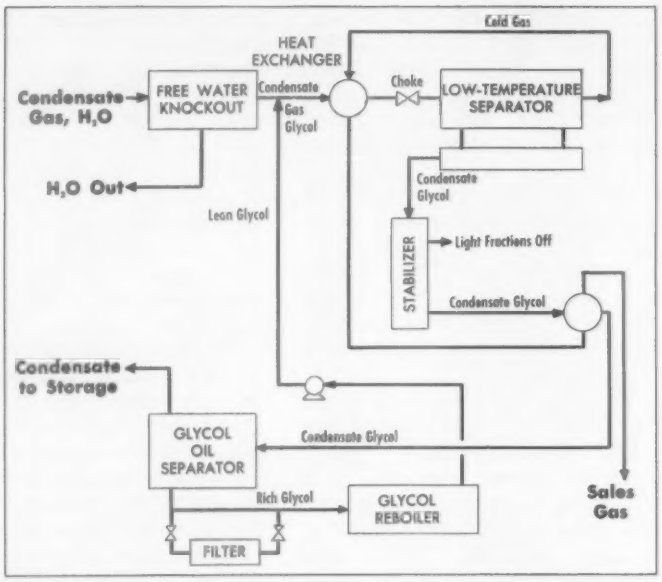
NEXT WEEK

Pipeline Construction Costs

The Journal's fourth annual pipeline cost study based on statistics from a variety of sources will analyze important factors in construction, such as surveys, grading and clearing right-of-way, coating and wrapping, hauling and stringing, pipe laying, and testing.

If it's cost data you want, read this timely report in next week's issue.

Let glycols help inhibit hydrate formation



GLYCOL INJECTION gives best hydrate inhibition if a specially designed atomizing nozzle is used. Fig. 1.

• Here's how to select the right glycol, injection rate, and concentration to give good inhibition in low-temperature units. Also included are pointers to prevent or correct common operating troubles.

PART 1 OF TWO PARTS

BY J. L. ARNOLD AND R. L. PEARCE
Dow Chemical Co.

HYDRATE FORMATION during the low-temperature processing of natural gas can result in decreased throughput, plugged orifices, frozen control valves, and many other operating problems.

A simple means of preventing hydrates is to remove the free water, or introduce an inhibitor to selectively dissolve in the water phase, thereby altering the availability of water for crystal growth.

Hydrate inhibition is not new. As early as 1934, Hammerschmidt[1] reported the effect of alcohols and ammonia on the hydrate-formation point of natural gas. Both of these materials suffer from serious disadvantages. Alcohols, such as methanol, are rather expensive and cannot readily be recovered; ammonia reacts with carbon dioxide in the gas to form solid ammonium carbonate.

In marked contrast, glycols, which are also effective inhibitors, have none of these disadvantages and their use is growing rapidly.

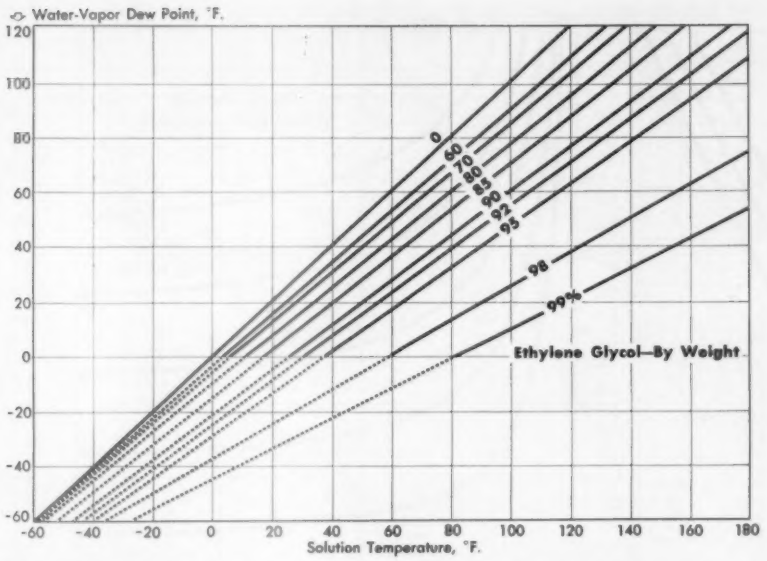
The use of glycols for hydrate inhibition is outlined in detail in this discussion. Material is included to help select the proper glycol, calculate injection rates, and determine minimum withdrawal concentrations. Also, glycol losses and maintenance factors are discussed, along with case histories.

Low-Temperature Separation

A low-temperature separator that uses glycol injection operates as follows: Well-stream gas enters a knockout where excess water is removed. Downstream of the knockout glycol is injected. A number of different devices may be used for injection. Very often, this is accomplished with a straight piece of small-diameter pipe projecting through the transmission-pipe wall. But where better mixing is desired, a standard injection nozzle that atomizes the glycol to a fine mist is used.

Following injection, the glycol-gas mixture flows through heat exchangers, where it is cooled below the normal hydrate-formation temperature (possible because of the presence of glycol). The gas next passes through a choke and is further cooled by expansion and then enters the separator for the removal of condensates. The condensate thus obtained consists of a mixture of glycol, water, and liquid hydrocarbons. The aqueous glycol is separated from the liquid-hydrocarbon condensate and sent to a reboiler for distillation to remove the water. After reconcentration, the recovered glycol is returned to the glycol injection point to complete the circuit. Fig. 1 shows a typical low-temperature separation unit.

Dew point of the effluent gas from a glycol injection unit depends not only on the temperature of the low-temperature separator, but also on the amount and concentration of glycol injected. Provided adequate contact is achieved between the injected glycol and the gas stream prior to the temperature-reduction step, equilibrium conditions can be assumed in the separator by which an estimate of the gas dew point



WATER-VAPOR DEW POINT in equilibrium with aqueous ethylene glycol can be found from this plot. Fig. 2.

can be made. As an example, the effluent-gas dew point from a low-temperature separator operated at −40° F. and in equilibrium with an 85% ethylene glycol solution will be −48.5° F. (see Fig. 2). The most important consideration is whether or not adequate contact has been achieved immediately following the injection of the glycol solution. Assuming adequate contact, near theoretical injection rates will suffice.

However, at least two factors may affect the final selection of a suitable, or practical, injection rate. One consideration arises from the availability of pump circulating capacity near enough to the calculated requirements. Where excess pump capacity exists and economics dictate the use of available equipment, variable-flow drives can be used to provide a suitable operating range.

Nozzle design may also dictate a specific injection rate depending upon the density and viscosity of the injected glycol, and the system operating pressure. Many injection-nozzle manufacturers provide data on the optimum conditions necessary for the proper functioning of a given nozzle design. Experience has shown that under optimum conditions, a fine mist or fog will result, whereas, any other combination will produce only ineffectual droplets of the injected glycol. Nozzle adaptation and orientation may require actual in situ testing to establish the optimum injection conditions.

Glycol dispersion. At this point it might be worth while to review field experience resulting from inadequate or incomplete atomization of the injected glycol. Typically, glycol is injected only a short distance away from a heat-exchanger tube header. Quite often injection is accomplished with only a straight piece of pipe. However, on some occasions a fogging nozzle is used but is ineffectual due to improper injection conditions.

As a result, glycol is injected in the form of large droplets which fall down to the lower half of the tube header. Inadequate contact results, allowing wet gas to pass through the upper bank of heat-exchanger tubes. Hydrates form in these tubes, restricting the rate of flow and finally plugging them off completely. This results in higher gas velocities through the lower bank of tubes; however, these tubes are partially flooded with the glycol which has not been properly dispersed into the gas phase. The high-velocity flow of gas whips the glycol into a foam.

This is a mechanical rather than a surfactant-type foaming condition since the glycol sample cannot be made to foam in the laboratory. Similar results have been reported when highly concentrated glycol is injected and insufficient dilution by absorption of water from the gas phase occurs.

In order to reduce this trouble, it is necessary to inject further downstream from the gas-cooling device, take the necessary steps to insure complete automization or fogging of the glycol, and use as dilute a glycol solution as practical.

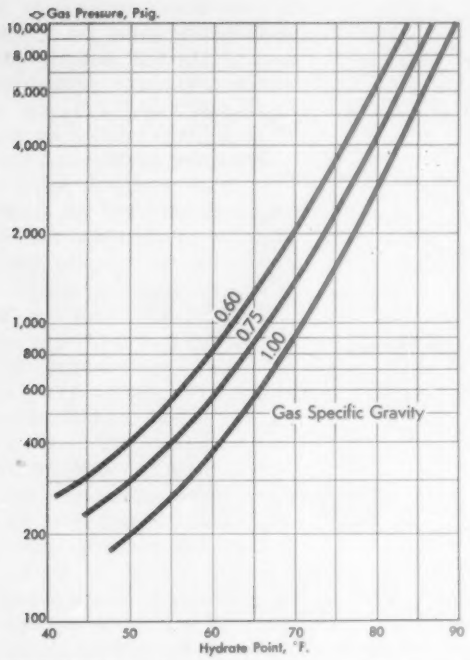
Separation problems. A few cases have been reported where glycol contained sufficient gas under high pressure to decrease the specific gravity of the glycol-water phase. When this occurs, a layer of "buoyant" glycol will "float" on the surface of the hydrocarbon condensate layer resulting in considerably higher glycol losses.. Warming and increased residence time will reduce this problem.

Separation of the glycol from the liquid hydrocarbons is a function of settling time as well as of the above factors. The residence time in the separator should be in the 7-14-minute range under ideal conditions. If the settling time is too short, part of the glycol will be carried along with the condensate to the stock tank.

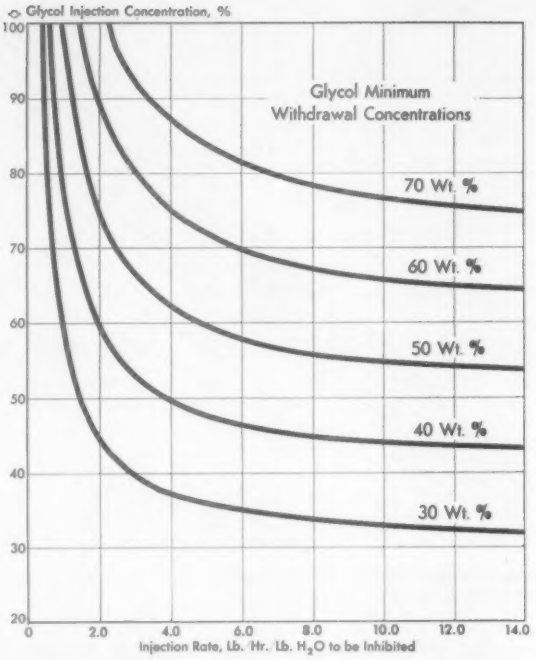
A common problem in low-temperature separation units is the formation of emulsions during separation of the glycol and condensate. These are sometimes formed because of the presence of well-treating compounds. If an emulsion develops, the use of a larger separator which permits a longer residence time will give a better separation. Since emulsions are adversely affected by water, more dilute glycol solutions (staying within the operating range) simplify the separation. Warming also helps break an emulsion down. The following table illustrates the effect of temperature on emulsion break time.

Temp., °F.	Vol. Ratio HC/glycol	Emulsion Break Time, Min.
32	0.5	4.0
40	0.5	4.3
55	0.5	3.4
70	0.5	2.6
80	0.5	2.1
77	0.5	2.3
77	2.0	2.7
77	14.0	4.1

If the above methods of breaking emulsions are unsuccessful, one of the many commercial antiemulsion agents can be used. The silicons have been very successful in this application; however, emulsions vary considerably in nature, and it is quite often necessary to screen numerous materials before a suitable compound can be found.



CONDITIONS under which hydrates will form in natural gas are shown in this figure. Fig. 3.



INJECTION RATES for ethylene glycol can be estimated from the above plots. Fig. 4.

Salt contamination of the glycol is a common problem in low-temperature separation. The salt deposits out on tubes of the reboiler owing to its reduced solubility at higher temperatures. The salt effectively reduces heat transfer which, in the case of a direct-fired unit, may cause burnout and failure of the fire tube. If salt contamination cannot be completely prevented, purification of the glycol is required. This may be done by distillation, ion exchange, or ion exclusion.

Special filters have also been developed which are useful in removing salt, high-molecular-weight hydrocarbons, mill scale, and downhole inhibitors.

The required concentration necessary to give proper protection can be determined from the Hammerschmidt equation:

$$d=\frac{2335\ W}{100\ M-MW}$$

Where:

d=°F. by which the freezing point of the gas hydrate is lowered.

M=molecular weight of the glycol.

W=weight per cent of the final concentration of glycol.

To illustrate the use of this equation, assume the following set of conditions:

Gas pressure	1,000 psig.
Gas temperature	85° F.
Ground temperature	40° F.
Gas specific gravity	0.75
Total gas handled per day	8 M.M.s.c.f.

From the hydrate formation curves in Fig. 3 it is seen that a saturated gas with a specific gravity of 0.75 at 1,000 psig. has a hydrate point of 67° F. Thus, the hydrate depression required is 67°−40° or 27° F. Assuming ethylene glycol (mol. wt.=62.1) is used, the following substitutions are made in the equation and W determined:

$$d=\frac{2335\ W}{100\ M-MW}$$

$$27°\ F.=\frac{2335\ W}{6210-62W}$$

W=41.8% by wt. ethylene glycol concentration

Calculate injection rate. From Table 1 it is seen that saturated gas at 85° F. and 1,000 psig. contains 39.1 lb. H_2O/M.M.s.c.f. with 8 M. M.s.c.f. of gas being processed daily, this amounts to

$$\frac{39.1 \times 8}{24\ \text{hours}}$$

or 13 lb. of water per hour entering the system. Assuming hydrate depression is to be achieved by injecting 67 wt. % ethylene glycol, the injection rate required to produce a final glycol concentration of 41.8% is calculated.

Let X=lb. of 67% ethylene glycol to be injected.

Let Y=lb. of 41.8% ethlyene glycol to be withdrawn.

13 lb./hr.=lb. of water to be removed.

Then determine the amount of glycol required for each pound of water as follows:

Water balance: $1+0.33\ X=0.582\ Y$

Glycol balance: $\frac{0.418\ Y}{0.67}=0.625\ Y$

Substituting: $1+(0.33 \times 0.625\ Y)=0.528\ Y$

$$1+0.206\ Y=0.582\ Y$$

$$Y=\frac{1}{0.376}=2.66\ \text{lb. of } 41.8\%$$

ethylene glycol recovered per hour. X=0.625; Y=0.625 x 2.66=1.66 lb. of 67% ethlyene glycol.

Thus, for every pound of water contained in the gas, 1.66 lb./hr. of 67% ethlyene glycol must be injected. Since the quantity of water to be inhibited amounts to 13 lb. per hour, it is necessary to inject 13

TABLE 1—EQUILIBRIUM MOISTURE CONTENTS OF NATURAL GASES ABOVE THE CRITICAL TEMPERATURE

Pounds per M.M.C.F. where P_b = 14.7 psia., t_b = 60° F.

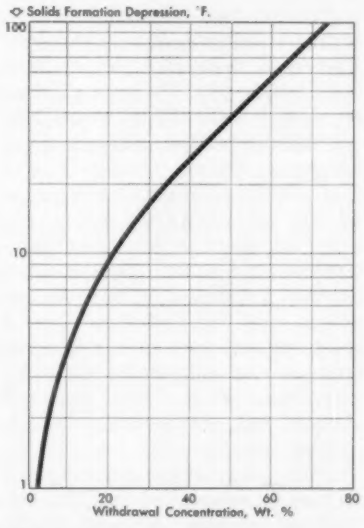
	Psia.					
°F.	500	600	700	800	900	1,000
50	21.3	18.5	16.5	15.0	13.8	12.9
52	22.9	19.8	17.7	16.1	14.8	13.8
54	24.5	21.3	18.9	17.2	15.8	14.7
56	26.7	22.8	20.3	21.0	19.3	18.0
58	28.1	24.4	21.7	22.4	20.6	19.1
60	30.1	26.1	23.2	21.0	19.3	17.9
62	32.2	27.9	24.7	22.4	20.6	19.1
64	34.4	29.8	26.4	23.9	22.0	20.4
66	36.8	31.8	28.2	25.5	23.4	21.8
68	39.3	33.9	30.1	27.2	25.0	23.2
70	42.0	36.2	32.1	29.0	26.6	24.7
72	44.8	38.6	34.2	30.9	28.4	26.3
74	47.7	41.1	36.4	32.9	30.2	28.0
76	50.9	43.8	38.8	35.0	32.1	29.8
78	54.2	46.7	41.3	37.3	34.2	31.7
80	57.7	49.7	44.0	39.7	36.3	33.6
82	61.4	52.8	46.7	42.1	38.6	35.7
84	65.3	56.2	49.7	44.8	41.0	37.9
86	69.5	59.7	52.8	47.6	43.5	40.3
88	73.8	63.5	56.1	50.5	46.2	42.7
90	78.5	67.4	59.5	53.6	49.0	45.3
92	83.3	71.5	63.1	56.8	51.9	47.8
94	88.4	75.9	67.0	60.3	55.0	50.6
96	93.8	80.5	71.0	63.9	58.3	53.9
98	99.5	85.3	75.2	67.6	61.8	57.0
100	105	90.4	79.7	71.6	65.4	60.4
102	112	95.8	84.4	75.9	69.2	63.9
104	118	101	89.3	80.2	73.1	67.5
106	125	107	94.5	84.9	77.4	71.4
108	133	114	99.9	98.7	81.7	75.4

x 1.66, or approximately 21.6 lb. per hour of 67% aqueous ethylene glycol.

Graphical solutions. The Hammerschmidt equation has been used to prepare Fig. 5, a set of curves designed to simplify ethylene glycol injection problems. Given the degree of hydrate depression and the concentration of injection glycol, the minimum glycol withdrawal concentration can be read directly from the graph. For example, where hydrate depression of 27° F. is required and 60% ethylene glycol is to be injected, the minimum glycol withdrawal concentration is found to be about 42%.

Similarly, the injection rate can be estimated by referring to Fig. 4. In this figure, the initial glycol concentration line (60%) is extended to intersect the 40% parameter, extrapolated to 42%*, and a vertical line dropped from the point of intersection to the horizontal axis to determine the number of pounds of ethylene glycol which must be injected per hour to inhibit 1 lb. of water. In the present example this amounts to 2.25 lb. of glycol.

It is important that the freezing point of the injected glycol be well below the lowest operating temperature of the system. This point may be determined easily from Fig. 6. Preferably, injection glycol with a concentration of 60-80% is used, because material in this range has no crystallization point.



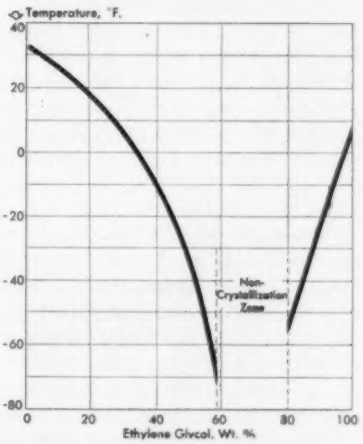
MINIMUM glycol withdrawal concentration can be read directly from this graph. Fig. 5.

The choice of which glycol to use as a hydrate inhibitor in natural-gas streams depends to a large extent upon the composition of the gas. If the glycol is to be injected into a transmission line transporting natural gas only, ethylene glycol is the most logical choice. On a pound per pound basis, it affords the greatest hydrate depression of any of the glycols.

On the other hand, ethylene glycol is usually not practical for use in gas-dehydration equipment due to its high vapor pressure. Diethylene or triethylene glycols are better suited for such jobs. Therefore, whenever glycol dehydration is used in conjunction with glycol injection, it is usually better to use a single higher glycol for both operations. By so doing only one regeneration unit is required and only one glycol need be stocked. Furthermore, any accidental carryover of injection glycol through the separator does not disrupt the dehydration operation. Diethylene glycol is often the best compromise for these combined operations.

If the glycol is to be injected ahead of a low-temperature separation unit where the glycol-water solution will ultimately be associated with liquid hydrocarbons in the separator, ethylene glycol once again is the best choice since it has the lowest solubility in high molecular weight hydrocarbons.

*Extrapolation should be done at right angles to the curve rather than perpendicular to the axis of the graph.



CRYSTALLIZATION temperatures of aqueous ethylene glycol should be checked before specifying injection concentration. Fig. 6.

Cosden "foams" oil and salt water from gas-drilled hole

. . . thus providing an economical solution to a troublesome problem

BY ED McGHEE
Drilling Editor

HOLE UNLOADS IN 21 MINUTES after slug of water-foamer mixture was pumped down drill pipe. Previously, hole had been gas drilled 162 ft. with virtually no returns. Starting above, first returns began to arrive at the surface as accumulated oil and salt water are discharged from the annulus. Then, well begins making strong heads. Previously, common fresh-water foamer had been ineffective in removing this fluid. In final pictures, uniform mixture of oil, salt water, cuttings, and gas blow from line as new foamer does its work. Process was repeated several times to unload hole and later to drill new hole.

AN INEXPENSIVE solution for an old problem in air and gas drilling has been found by Cosden Refining Co. and Grappe Drilling Co. When these firms encountered large quantities of salt water and oil while gas drilling, they were able to successfully foam the fluids out of the hole.

In the past, it has been difficult to impossible to cope with salt water and oil. Commonly used foamers which work well in fresh water become ineffective as salt and oil concentration rise.

The success of Cosden and Grappe in this case may have important implications for the remainder of the industry. First, it seems that areas not economical to air drill in the past because of salt-water and small-volume oil zones, now may use this money-saving method. Second, it will be easier to use air or gas to clean out or work over old wells. And, third, it may become attractive in many cases to extend air or gas drilling into the pay zone itself instead of stopping above it as in the past.

No trouble to 3,000 ft. The Cosden well was its 1 Miller near Ozona in West Texas. After setting 8⅝-in. surface casing at 1,000 ft., the contractor, Grappe Drilling, gas-drilled a 7⅞-in. hole to 2,900 ft. To this depth, the hole was "dusting dry"—there was no indication of any fluid in the returns. Gas for drilling came from a nearby well; and circulating pressure was 80 to 90 psi.

From 2,900 ft. to 3,162 ft., there were little returns of any kind to the surface. Gradually circulating pressure built up to 400 psi. It was evident that cuttings were balling up on the drill string and the walls of the hole. So, the drill string was pulled up several stands to avoid sticking.

Cosden decided to attempt cleaning out the hole using a popular nonionic surfactant which had proved effective as a fresh-water foamer. No one was surprised when this attempt failed since indications were that the hole had a buildup of both oil and salt water.

New salt-water foamer. Cosden then decided to try a new foamer which had been successful in New Mexico's Empire Abo field where fluid with 5 to 10% oil is often drilled with gas. The new product is Atlas Powder Co.'s Afrox 200, a compound readily soluble in water for use on the rig.

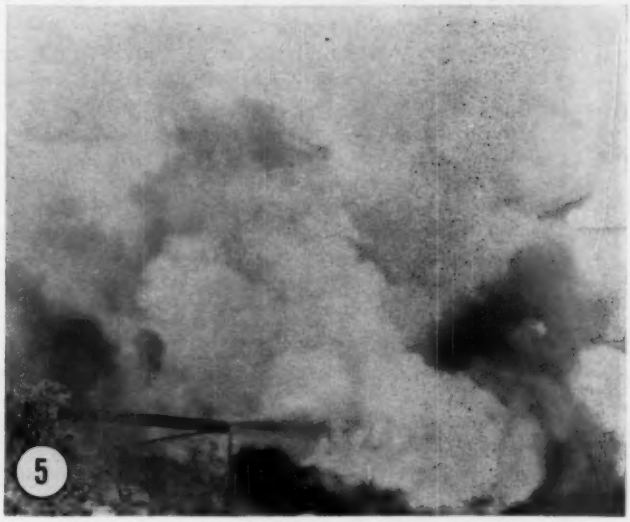
There was no injection equipment on the rig, so the rig pump was piped to inject a water-base solution containing the salt-water foamer. A piece of 4-in. pipe was placed with one end about 2 to 3 in. below the point in the rig's water tank where the pump took suction. Other end of the pipe was slanted upwards and the foamer poured into it slowly.

Then, slugs of the foamer-water mixture were pumped into the drill pipe at intervals. Volume of the slugs were calculated by counting pump strokes. The first slug was 12 bbl. of water with 6 gal. of foamer and required 5 minutes to inject.

All this time, gas was being circulated through the well. Immediately after the foamer-water mix was displaced, gas-circulating pressure began to rise; from 400 psi. it rose gradually to 825 psi. For the first 20 minutes, there were no returns. Then, the well began heading violently. For another 20 minutes, heads of oil, water, and cuttings came to the surface. Of a total of 45 to 50 bbl. of fluid recovered, some 60% was oil.

Pressure dropped slowly during this violent discharge. After the annulus had unloaded, the hole could be circulated at only 90 to 100 psi.

Cosden and Grappe continued blowing the hole for a time and added a single joint of drill pipe to the string. They then pumped in another slug of the foamer-water mixture. Some 6 bbl. of water with 2 gal. of foamer were pumped in over a 3-minute interval. This time there were returns only 9 minutes



after the slug started in. A large quantity of oily water and cuttings came out. Pressure rose to 500 psi. at one point but dropped back to a normal 90 to 100 psi. after the head passed.

After the hole was blown for a half hour, a complete 90-ft. stand was put in the string; as it was being lowered into the hole, the bit hit a bridge. The kelly was put on and a third slug of water-foamer mix was pumped into the hole. Like the previous slug, this one contained 6 bbl. of water and 2 gal. of foamer.

Returns reached the discharge line in 5 minutes. Quantities of oil, foam, and cuttings came to the surface. Pressure rose to 450 psi. but dropped rapidly afterwards to normal.

Back to drilling. This procedure was repeated single-by-single until the bit got back to the old bottom at 3,162 ft. Gas circulation and rotation were commenced to drill new hole. Gradually, the circulating pressure built up to 250 psi. and returns at the discharge line fell off to nothing.

After the bit had made 15 ft., the hole was slugged again with the water-foamer mixture. Just as before, the mixture brought back quantities of cuttings, oil, water, and foam. And, just as before, circulating pressure fell back to normal after the annulus had unloaded.

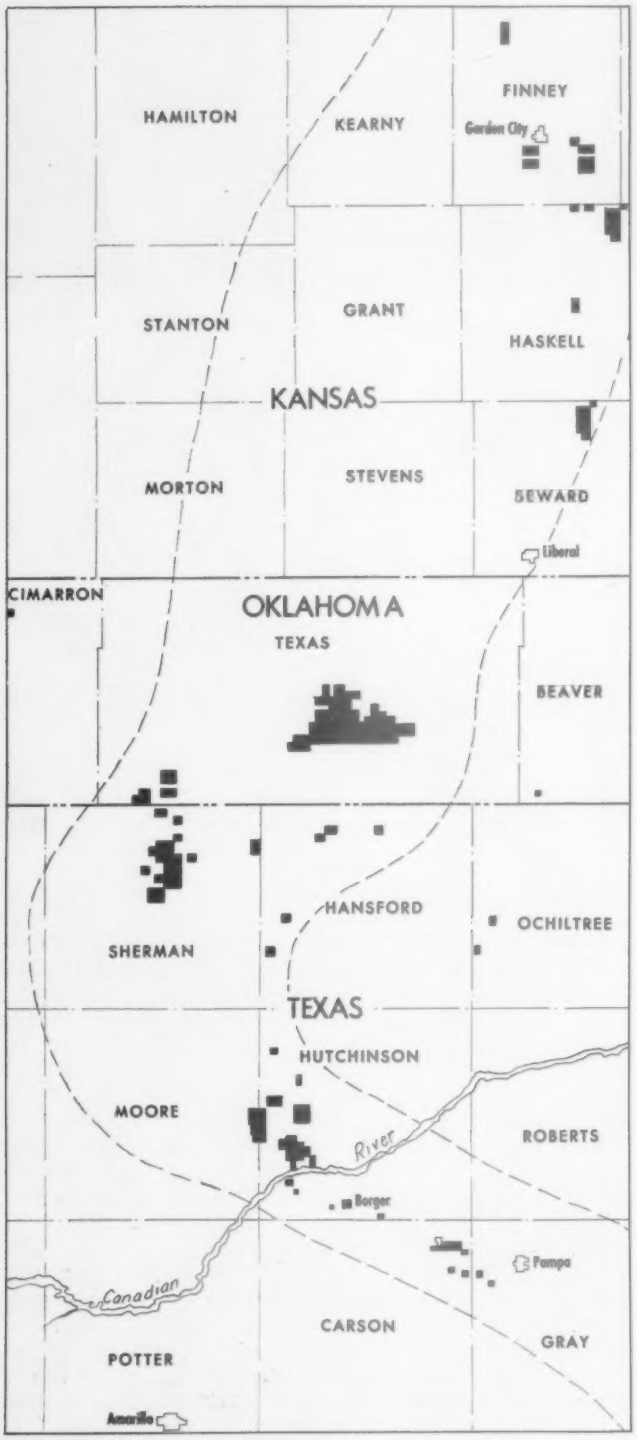
So, a pattern was established: drill awhile, slug the hole with foamer, then go back to drilling. This procedure was followed until the bit reached 3,374 ft. At this point, the hole was mudded up so that cores could be taken and drill-stem tests made.

Mud was used to drill to 3,600 ft. where 7-in. casing was set. Below the 7-in., gas drilling resumed in 6¼-in hole. Apparently, all wet zones had been cased off because the hole "dusted dry" to 9,250 ft. where a gas zone was found.

Saved much time. It had required only 4½ hours to clean out the hole with the salt-water foamer. Only $100 worth of the Afrox 200 had been used.

Had the foamer been unsuccessful, it would likely have been necessary to pull the drill string, mud up, and clean out the hole to bottom. And, the interval down to 3,374 ft. could not have been gas drilled.

Skelly engineers expect to save thousands of dollars as . . .



A CHUNK OF MAGNESIUM is dropped into the ground, to give up to 23 years' protection, from electrically stimulated corrosion, to well casing in Hugoton-Panhandle fields. The map at left shows the extent of the area involved.

Hugoton wells get cathodic protection

BY MERLE BLAKELY
Journal Staff

CATHODIC PROTECTION to curb external casing corrosion is being installed on a mass scale in Hugoton and Panhandle fields of Kansas, Oklahoma, and Texas.

About 200 Skelly Oil Co. wells are involved in an area nearly 200 miles long. The job was started because several casing leaks meant expensive workover jobs. And indications are that more jobs would be needed unless a stop was put to the casing corrosion in the area. Costs are estimated at about $350 per well, on the average.

Problem probed. Several years

ago, members of the Hugoton chapter of the Society Petroleum Engineers of the AIME circulated a questionnaire to operators. Replies indicated there had been about 60 recognized casing leaks.

This figure is small compared to the 7,000 wells in the area. The incident rate reflected in supplemental reports, however, points to the possibility of at least 300 leaks by 1970. An estimated 2,000 wells in the Hugoton - Panhandle areas have some form of protection now.

Interest was intensified because many wells which had failed or in which leaks were detected were less than 5 years old.

Skelly has lost no wells in these areas but costly repairs, involving damaged casing, have been experienced.

Investigations show that sulfate-reducing bacteria are the primary cause of corrosion. These microorganisms convert sulfate in the formation to sulfide, which invites a direct chemical attack on the metal surfaces. In adjacent areas, casing corrosion is believed caused by galvanic action as well as by bacteria.

Repair of leaks and removal and replacement of affected casing is just one of the results of corrosion. The other is the possible reservoir damage that is caused when sand and water go through the holes in the casing and come in contact with the producing formation. This could materially reduce the reservoir's productivity, and in some cases has led to early well abandonment. But the cost of repair can't be overlooked. These jobs have ranged from $3,000 to $70,000 each.

Most casing leaks in the area have been associated with the Permian Glorietta sand formations at depths of 800 to 1,300 ft. There have been a few leaks at shallower depths, and some below 3,100 ft. The deeper leaks occur opposite the Permian, Wichita-Albany formation but corrosion also is suspected as being associated with the Wolfcamp series.

Buried protection. Chief feature of each well's protective system is that it will be engineered for optimum performance, Skelly engineers say.

This requires preliminary measurement of current needed for protection. Corrosion Services, Inc., contractor on the job, has completed this phase of the work, running log current-potential curves.

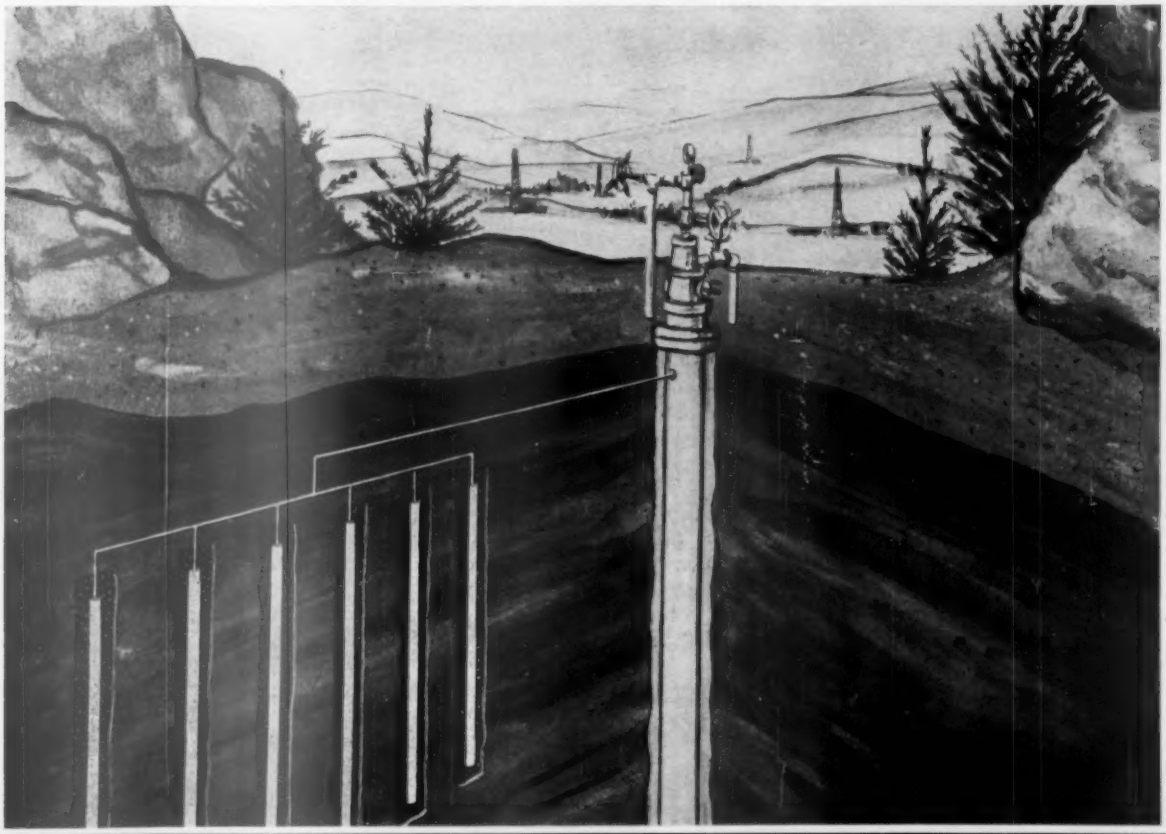
With this factor determined, the number and size of magnesium anodes needed for each well can be found. Anode installation is based on well-to-earth potential, resistance, and soil resistivities. Magnesium - earth potential is higher than magnesium-casing, so a battery action is set up.

Initial current requirements for each well range from 0.4 to 5.8 amp. The higher requirements are associated with deeper wells. Skelly's contract with CSI provides that the initial current output of the anodes be within 5% of the current quoted. Because the current output of sacrificial magnesium anodes is limited, rectifiers or generators will be used to supply the higher current requirements.

The contract also specifies that anodes for the ground beds will be buried no closer than 60 ft. nor farther than 200 ft. from the wellhead. Lead wires and anodes shall be buried to a minimum depth of 3 ft.

Skelly has directed that prior to installation, possible interference with other metallic structures near the wells be checked, and that methods be used to prevent damage to these structures.

ANODES of identical size and shape are placed at each well-protection bed. They are buried a minimum of 36 in., from top, and at least 60 ft. from the casing.



CREWS of Corrosion Services, Inc., are averaging three wells a day in the push to establish cathodic protection for Skelly's 200-plus wells in Hugoton and Panhandle fields.

After the installations are complete, all casings being protected by magnesium anodes will be prepolarized by applying direct current from outside sources, assuring immediate polarization and protection.

Costs reduced. By use of existing facilities in the field, Skelly has worked additional economies.

A savings of about $3,000 is expected by using existing concrete salt-water-disposal pits, at six well sites, to submerge anodes instead of burying them. A minimum of 2 ft. of brine will be maintained in these pits.

The concrete pit walls are 4 to 6 in. thick. Anodes will be laid on the bottom and connected to the wellhead.

In the heart of the Oklahoma section of Hugoton field 10 wells will get satellite protection from two rectifiers, which were previously installed to cathodically protect a portion of Skelly's Hugoton gas-gathering system. In addition to a savings of about $5,000, this arrangement will avoid an existent interference problem.

Contract detailed. Skelly engineers believe the stringent specifications set out in the contract, and the manner in which bids were requested, are radical departures from usual procedures.

First, the company requested contractors to submit firm quotations for installations based on specific sets of criteria known to cover the range of conditions in the area under consideration.

This quotation was to be based on two separate installation lives; namely 9 to 14 years and 18 to 23 years.

Quotations also were asked on a per well basis for conducting current requirement tests, well-to-earth resistance, and soil resistivities at various specified depths at each well site.

These quotations, based on incorporated contract specifications, together with the individual well tests assure tailor-made installations for each well.

The contract provides that initial current output be within 5% of the quoted value. This output is to be obtained using an anode backfill composition of 75% gypsum, 20% bentonite, and 5% sodium sulfate, without addition of other soluble salts. A calibrated shunt will be installed at each wellhead to allow initial and subsequent current output measurements. Field men will keep tab on current output of the installation.

All current requirement tests are to be conducted so that data are reproducible upon verification by Skelly. The test data also correlate with the Lane-Wells down-the-hole casing potential profile surveys.

Upon completion of individual well tests, a bid was required by Skelly for each well which was checked against the initial quotation.

Contractors agreed that the contract stipulation of a guaranteed initial current output having only a ±5% tolerance was a difficult one to meet. In past installations, a greater tolerance has been permitted.

Corrosion Services, Inc., expects its crews will install the mechanisms on two to three wells daily, and will complete the job in June.

Anodes to be used will vary from 2 to 10 ft. in length and come in many different shapes and sizes. Some are round and thin, others wide-diameter stubby chunks, and some are semicircular with one flat surface.

Skelly is protecting wells in Finney, Haskell, and Seward counties, Kansas; Cimarron, Texas, Ellis, and Beaver counties, Oklahoma; and Hansford, Hutchinson, Carson, Gray, Sherman, Moore, and Ochiltree counties, Texas.

D. C. Oglesbee, Skelly engineer, says field men and farm bosses have been enlisted to make the program click.

Meetings have been held with superintendents, engineers, and foremen, and written materials showing why the protection is considered necessary, and what it entails workwise and costwise, have been sent every man in a supervisory capacity in the area where wells are to be protected.

By its mass corrosion-attacking program, Skelly expects to extend appreciably the economic life of its properties in Hugoton and Panhandle fields.

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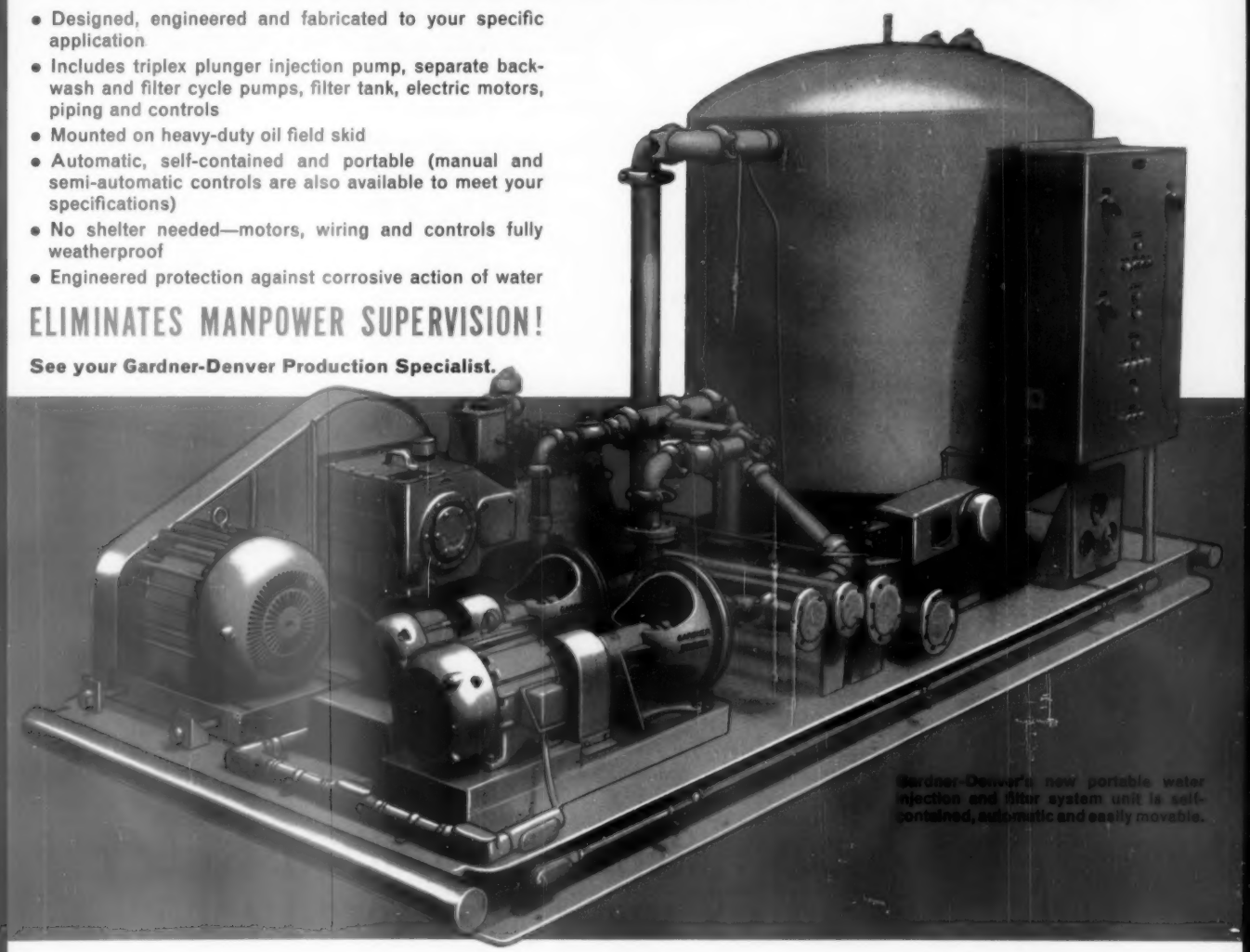

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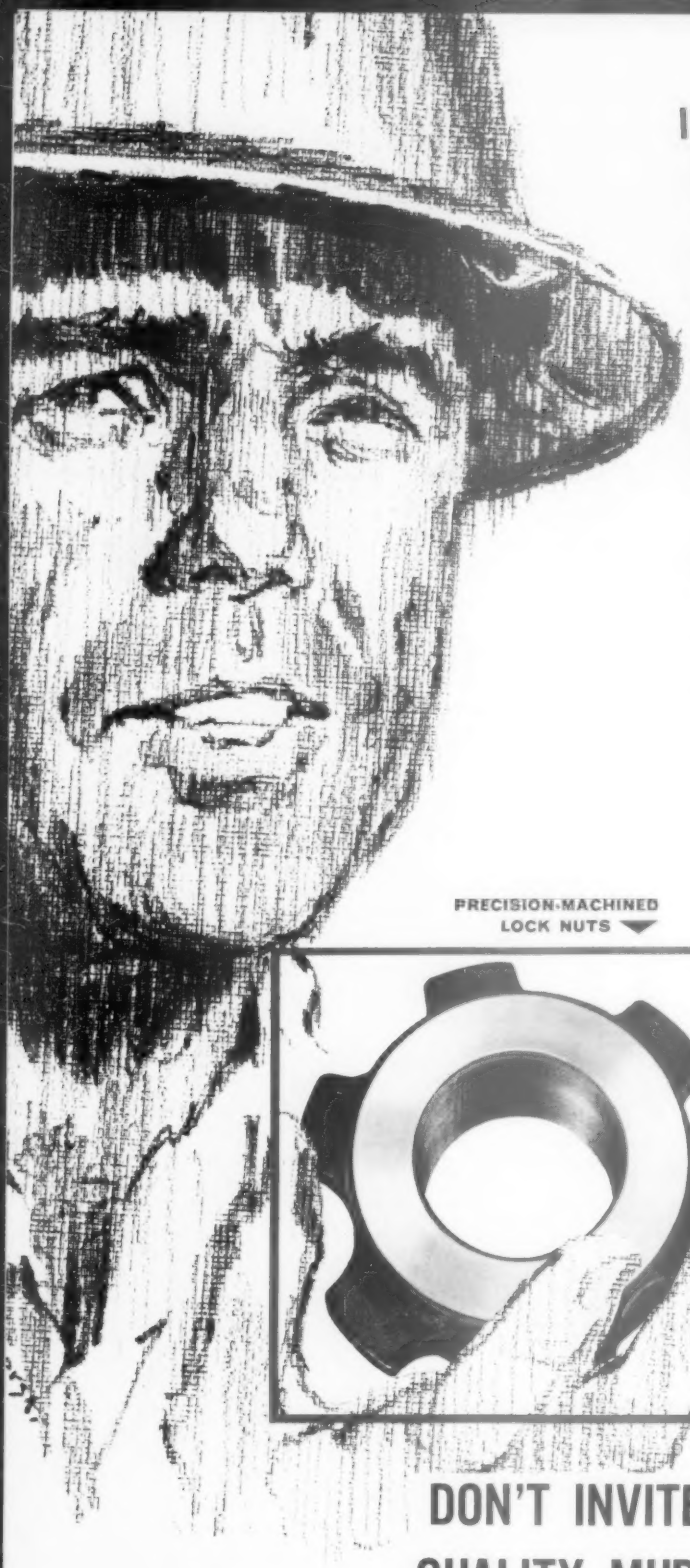

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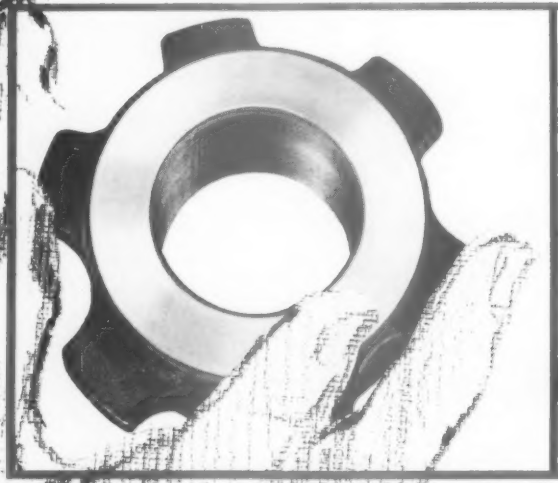

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Are we missing the cheapest solution to

Our crooked-hole problem?

BY S. R. KNAPP, Falcon Seaboard Drilling Co., Ardmore, Okla.

MY PURPOSE is to revive interest in the vertical hole.

For several years, we have put the accent on slant holes and on minimizing the problems that arise from such deviated holes. By this emphasis, we admit we have failed to develop a ready cure for hole deviation. We have simply decided to live with the problem for lack of a good remedy.

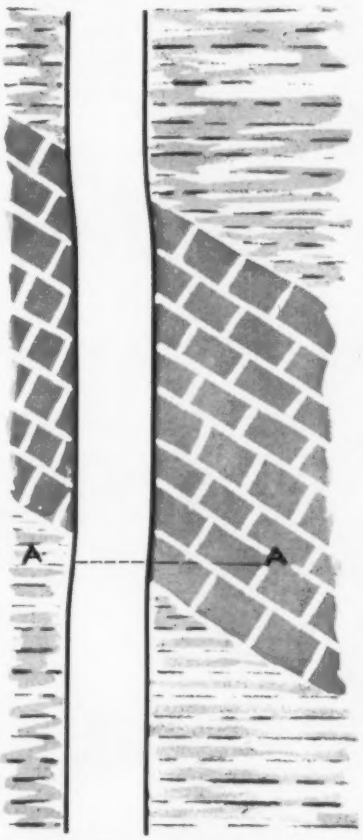
It was pointed out at the AAODC crooked-hole committee meeting in Dallas that, 6 years ago, crooked holes cost the industry some $50,000,000 per year. The annual cost has now been reduced to some $30,000,000 as a result of our latest methods of deviation control and by our accepting higher limits on deviation. Our goal is to reduce this amount even further. I know of no part of the drilling operation where this amount of money might be saved.

Relaxed deviation limits have brought much of the savings in crooked-hole drilling. The most enthusiastic supporters of stabilizers claim they improve penetration rates only 20%. This leaves a lot of room for improvement. We still must survey the hole often and change drilling weights and rates to regulate hole deviation.

We measure our progress in crooked hole by comparing drilling rates to those of several years ago and are satisfied with the results. If we compare drilling speed with what we get in straight holes, we will not be so complacent.

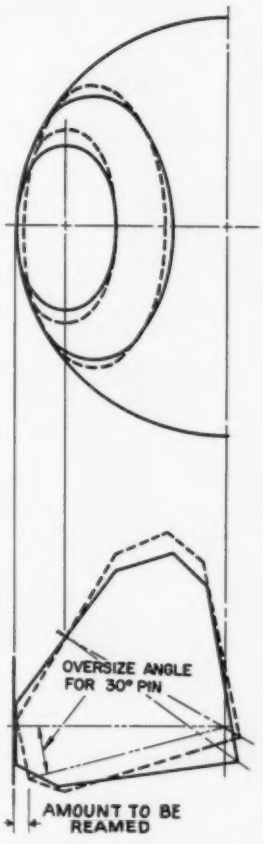
Example case. For several years, our emphasis has been on increasing deviation limits. Most thought that a few more degrees would solve their crooked-hole problems. At least one contractor found that this was not the answer. He stated at the AAODC meeting that he was forced to set deviation limits on a day-work contract to prevent excessive wear to his drill pipe. I think

EDITOR'S NOTE: There are many who take exception with some of the author's statements. A few disagree with him entirely. Nevertheless, he has an interesting analysis of the crooked-hole problem, and the problem is so vast we cannot afford to overlook any proposed solution. We think all drilling men will find their thinking stimulated by this new slant. Original presentation on this subject was at API Division of Production meeting, Tulsa, 1961.



LATERAL SHIFT of hole is a possibility as bit drills first from soft shale into harder lime and then again as it drills back into shale. This action could be cause of hole deviation on laminated, tilted formations.

SUGGESTED for straight hole is this downhole assembly. Main features are two flexible pipe sections above the two top full-gage stabilizers. Weight of drill collars above causes them to lay on the low side of the hole. Flexible pipes buckle. If they can be made to contact the high side of the hole, they may be able to point bit downdip to straighten hole.



REAMING is result of oversize diameter on gage tip of bit, in dotted-line cone. Solid-line cone does not have a reaming action. Reaming by bit is possible cause of hole deviation.

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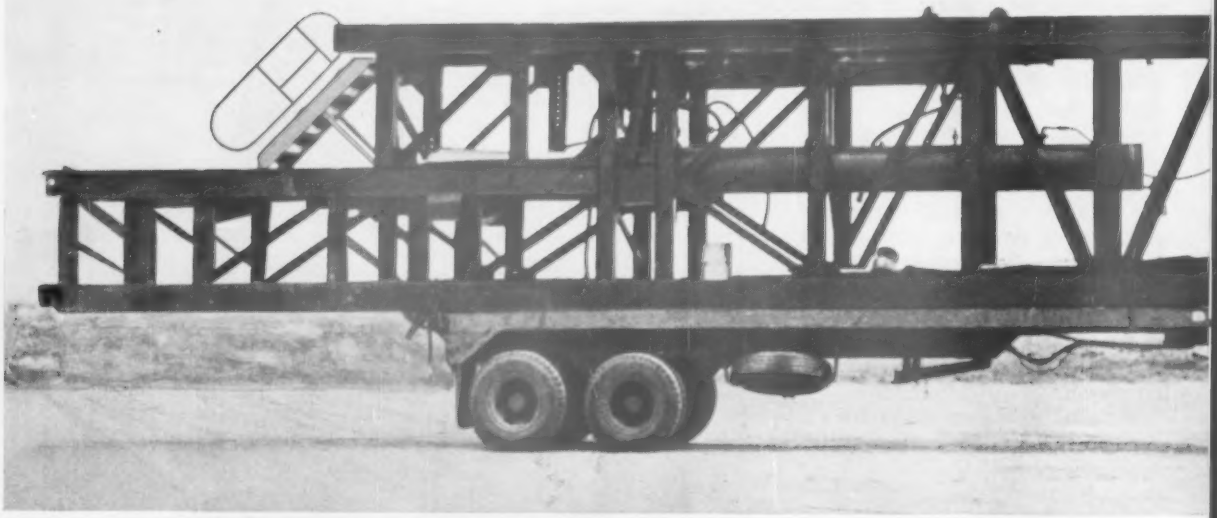

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that we all should recognize the cost of the excessive drill-pipe wear in holes with several changes in angle or direction. The damage to the pipe in this case was fatigue cracking caused by rotation in a dog leg. The o.d. wear was not mentioned but I am sure that it was bad.

The March 13 issue of The Oil and Gas Journal in describing the well stated that the trouble began when the hole took a sudden turn toward vertical as it crossed an unconformity. The contractor had been unable to keep the hole from gaining angle. And, for the same reasons, the hole could not be kept from returning to near vertical.

Unconformities are found in many wells in crooked-hole country and some change in angle will almost surely occur whenever the unconformity is crossed. A packed hole assembly would slow the rate of change of angle but the total change would be the same.

There are other risks run by the drilling contractor in slant holes. He cannot wash over the oversized collars commonly used. These collars tend to swab the hole in shale sections. Moreover, they raise the friction loss of drilling fluid, add torque in drill pipe while drilling, and increase drag while making trips. Also, as hole angle increases, fishing is more difficult in enlarged sections of hole and there is more danger of sidetracking the hole while drilling through a bridge.

We drilled a well near McKinney, Tex., using air from 7,500 to 12,000 ft. Deviation increased steadily from 5° at 8,000 ft. to 40° at 12,000 ft. There was no sudden change at any point. The drag on trips increased until it exceeded the yield point of the Grade E 3½-in. drill pipe. The pipe parted on a trip and the hole was lost.

I am sure that many others have had just such problems in high-angle holes or those with a sudden change in angle or direction.

Roots of the trouble. Dog legs have been found in near vertical holes. This fact is used as an argument in favor of slant holes. However, it is my opinion that dog legs in vertical holes are usually a consequence of making slope tests too infrequently in formations where no trouble was expected. If as much caution were used in vertical holes as in slant holes, dog legs would be avoided or detected quickly. Dog legs are caused by the same forces—or, rather, the same changes in severity of force—whether in vertical or slant holes.

What, then, is the cause of hole deviation? What are the forces that overcome the force of gravity on the drill collars and make the bit drill updip? Why is it more difficult to control deviation in some formations than in others where the formation is the same?

The big factor is formation dip. The degree of dip affects the severity of the force which causes a hole to deviate. Usually, deviation is updip. Only in formations with very steep dips does the bit ever drill downdip.

Why does the formation dip cause the hole to deviate? I believe it is because the alternating layers of formation have a different density or resistance to penetration by the bit. As the bit drills through these formations at an angle, the face of the bit encounters formations of different density at the same time. One portion of the bit may be drilling more dense formation than another portion. This allows the bit to move laterally into the less-dense formation.

The lateral movement may continue until stopped by the legs of the bit and the drill collar or some stabilizing device above the bit. There is evidence of this lateral movement in the bits that show abrasive wear on the legs. Such wear likely is from contact with the wall of the hole while the bit is still full gage at the cones.

Formations like the Woodford are composed of layers of very dense material alternating with layers of very soft material. These laminations increase lateral force at the bit.

What is bit's role? Rock-bit design may be a major factor in hole deviation. Rock-bit designers have of necessity concentrated on designs for the prevalent conditions, those in straight-hole formations. However, the bit design that results in the fastest penetration rates in horizontal formations, may also be the design that causes more rapid deviation in dipping formations.

In crooked-hole formations, we generally regard bit weight as the thing which controls the hole angle. There is, however, another approach we must consider. That is the reaming action of the bit itself. After all, reaming action is "sideways drilling." A bit which drills too efficiently sideways could be one cause of the hole drifting off vertical.

Reaming is a necessary action in a bit that has either oversize-gage tip diameter, or cones that are offset from center. Use of an oversize-gage tip diameter means that the gage surface slants toward the center of the hole so that it reams some portion of the hole.

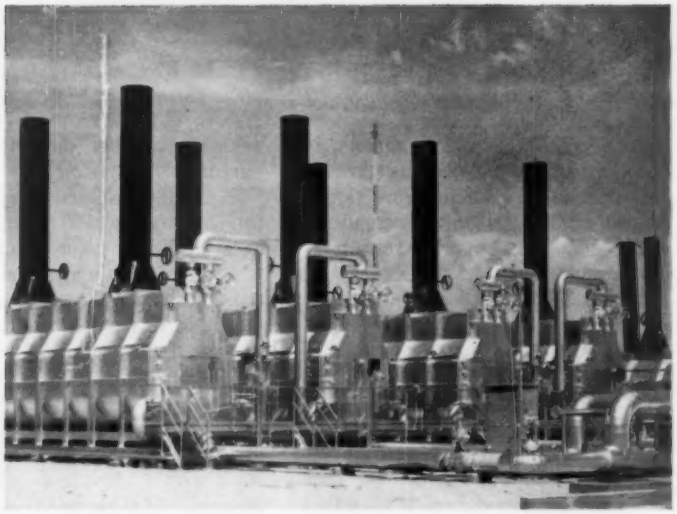
An example of the force generated by this reaming action was in a well near Lake Texhoma. A full-size sleeve stabilizer was run directly above the bit. The stabilizer was 12 in. long and made from steel tubing. Weight on bit was 12,000 lb. and rotary speed 120 r.p.m. Drill-collar weight was 25,000 lb. The bit locked four times in drilling 40 ft. of 7⅞-in. hole. Each time the weight was removed from the bit for a few revolutions and then drilling resumed as before.

Our conclusion was that the penetration rate exceeded the reaming ability of the bit as it drilled from a dense formation into a soft formation leaving a portion of the dense formation which caused the bit to lock. The bit was found to be in good condition when pulled. Another bit run under similar conditions did not lock; it has a better reaming-tooth design.

Alternate layers. Most of us had high hopes that air drilling would not be troubled by crooked-hole problem because very light bit weight is used. This has not proved to be the case: deviation is harder to control in air drilling than in mud drilling. In air drilling, the effect of the difference in density of alternating layers of formation is accentuated. Result is an increase in lateral movement of the bit.

In all shales we find layers of different density. This is apparent in cores cut through these formations. Some sections are eroded by the mud flow while others cut a full-size core. The alternating layers when titlted cause hole deviation.

Directional holes drilled through horizontal formations encounter the



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same forces found in vertical holes in tilted formations. In the directional holes weight can be used to increase deviation, not reduce it. The drill collar contacts the low side of the hole and a reamer is used as a fulcrum, forcing the bit to build angle. When a directional hole drills horizontal formations which correspond to severe crooked-hole conditions, the forces at the bit are stronger and the hole loses angle.

Putting to Practice

Assuming that the above theories are true, we can drill a near-vertical hole at satisfactory speed if we eliminate reaming by the bit and aim the bit in the direction we want.

For this reason, I propose a combination of stabilizers and flexible sections of drill collars which can orient the bottom collar and bit down dip. I have developed such a combination which uses the principles of directional control to apply the forces to the bit. Instead of forcing the bit to deviate, this method will orient the bit in a vertical direction as soon as it starts to deviate. The rate of change in angle will be controlled by the use of variable sizes of stabilizers in the bottom-hole assembly.

This method will start to correct deviation of a hole as soon as the "control point" of the assembly enters a deviated section of hole. This control point will be approximately 30 ft. above the bit. The lower assembly will have all the advantages of a packed hole but none of the disadvantages. All parts can be washed over. The rate of change of angle will be less than 1° per 100 ft. Corrective action will start as soon as any deviation is apparent.

I have conducted field tests of this method in 10 different wells. Most of the tests were made in wells where deviation was already at contract limit. In most of the wells I was able to reduce or hold the deviation angle while using more weight on bit.

One of the tests was on a Shell Oil Co. rig, Big Mineral field, North Texas. The 7⅞-in. hole was in shale with 4° deviation at bit weight of only 6,000 to 8,000 lb. We increased weight to 30,000 lb. with the tool and maintained angle. There are no increases in penetration rate due to poor hydraulics at bit.

On a Holliman Drilling Co. rig in East Madill field, a 7⅞-in. hole was being drilled in Woodford formation. Hole deviation was 4¾°, weight on bit was 4,000 to 6,000 lb., and deviation was increasing while drilling 2 ft. per hour. We ran the tool with 30,000-lb. weight and made 30 ft. with no increase in deviation. We made 15 ft. more and deviation increased ¼°. The bit was found to be out of gage when pulled and the stabilizer was worn. Four attempts were made to straighten the hole with whipstocks. All four attempts failed to reduce angle.

Drilling was resumed to total depth with deviation increasing to 9°.

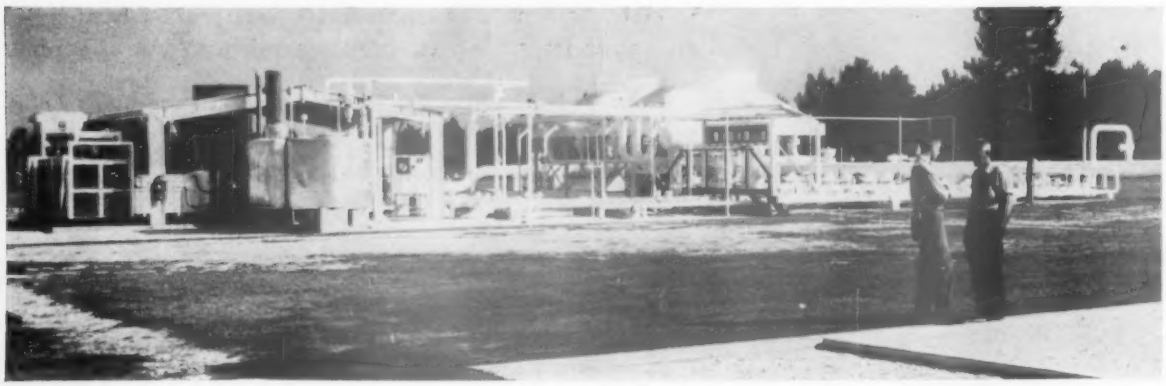
Frankfort Oil Co. had a Kid Williams rig in the Arbuckle Mountains west of Davis, Okla. It drilled a 9⅞-in. hole, deviation 4°. Bit weight was 15,000 lb. We ran the tool with 35,000-lb. weight and deviation dropped ½° in 30 ft. It increased ½° on the next joint due to overcontrol.

An Arrow Drilling Co. rig working for Sinclair Oil Co. in Susie pool North Apache, Okla., drilled 1,700 ft. with the tool using 15,000 lb. on bit. Drilling time and number of bits were cut in half and three whipstocks were saved compared to an offset well using regular bits.

A Parker Drilling Co. rig drilled for Skelly Oil Co. at Velma, Okla. The 9⅞-in. hole was 2½° off vertical with 6,000 to 8,000 lb. on bit. We ran the tool with 35,000 lb. on bit and reduced hole to ½° in 200 ft. of hole. We maintained the angle under 1° for 100 ft. of hole. Then, the bit crossed an unconformity and deviation increased to 3° in the opposite direction.

On a Fain-Porter Co. rig in Eola pool near Pernell, Okla., a 9⅞-in. hole was deviated 4½°. Weight on bit was 12,000 to 15,000 lb. and penetration rate was 2 ft. per hour. We ran the tool with 40,000 lb. on the bit and maintained hole angle for 200 ft.

I think that these tests prove that deviation can be controlled by proper use of this tool and bits.



THIS COMPACT, 1,250-hp. gas turbine compressor unit is installed at the Cypress, Tex., compressor station of Trunkline Gas Co., after undergoing a full year's test. Air filters and silencers are shown at the left, waste-heat boiler in the foreground, instrument panel and air fan exchangers at far right.

BY W. L. NELSON, Technical Editor and Petroleum Consultant

Questions on TECHNOLOGY

How to compute refinery "complexity"

1. We would appreciate knowing more of the complexity factors used in your answer of March 14, 1960. W.S.S.

2. Will you please explain how you compute "Complexity"? G.C.C.

3. Your method of weighting the complexity of refinery operations is understandable except for lubes. What should be used for lube capacity? W.J.D.

4. We would like to know more about how you arrived at your complexity factor in No. 80 of your Process Costimating Series. J.J.W.

Originally the complexity factor used in our answer of March 14, 1960, p. 189, of The Oil and Gas Journal, "How to Describe Refinery Complexity," was considered as simply a gross approximation of the kinds and amounts of processing conducted in a refinery. Little thought was given to the matter because it was clearly recognized as only an approximation, and because simplicity was a prime requisite of any such factor. The complexities of various types of refineries is also indicated in Process Costimating No. 57, September 28, 1959, p. 96, entitled "Complexity of Refinery versus Manpower."

However, so many readers have been interested (more than the four inquiries shown above) that a careful study has been made, and revised complexity factors are shown here. Fortunately, the revised factors do not change the over-all refinery complexities heretofore published by a significant amount except for lubricating-oil refineries which are higher by about 10%. The old and new factors for various processes are shown in Table 1. Also shown in Table 1 are approximate 1946 per barrel costs of the various process operations in case anyone desires to revise them.

Basically, the complexity factors are simply the ratios of the costs of various process operations to the cost of crude distillation and desalting (plus 50% for some of the auxiliaries needed in any refinery) and the final refinery complexity is only the weighted average of the factors for the process units that compose the refinery.

The cost of off-site facilities are not included because they are assumed to be a function of the cost of each process operation, except in the case of lube manufacture which includes an extra cost for the very large amount of steam needed in most lube plants. Capacities for each process operation are used as barrels per day feed capacity except in the case of polymerization, alkylation, and lube manufacture which are based on barrels per day of finished product.

The factor of 20 for naphthenic lube manufacture was built up somewhat as indicated for regular lubricating oils in Table 1, by considering such operations as injection of caustic soda and additives, percolation or acid treatment followed by clay contacting, some redistillation, some canning, and extra steam and storage. There is no way to state the complexity introduced by specialty products except to estimate the cost of the equipment involved. The following per barrel costs and complexity factors (process cost divided by $56.60) will serve as examples:

	$/daily bbl.	Complexity factor
Conventional solvents (many)	330	5.8
Benzene, T, X, separation	1,200	21.2
Cumene manufacture	960	17.0

Refinery complexity has been related to 1946 refinery costs (Process Costimating No. 80, September 26, 1960, p. 216) by means of the following empirical equation:

$$\$/\text{bbl.} = 47C + 234$$

A similar equation for 1960 costs (using Nelson Refinery Construction Cost Index, The Oil and Gas Journal, first issue each month) is:

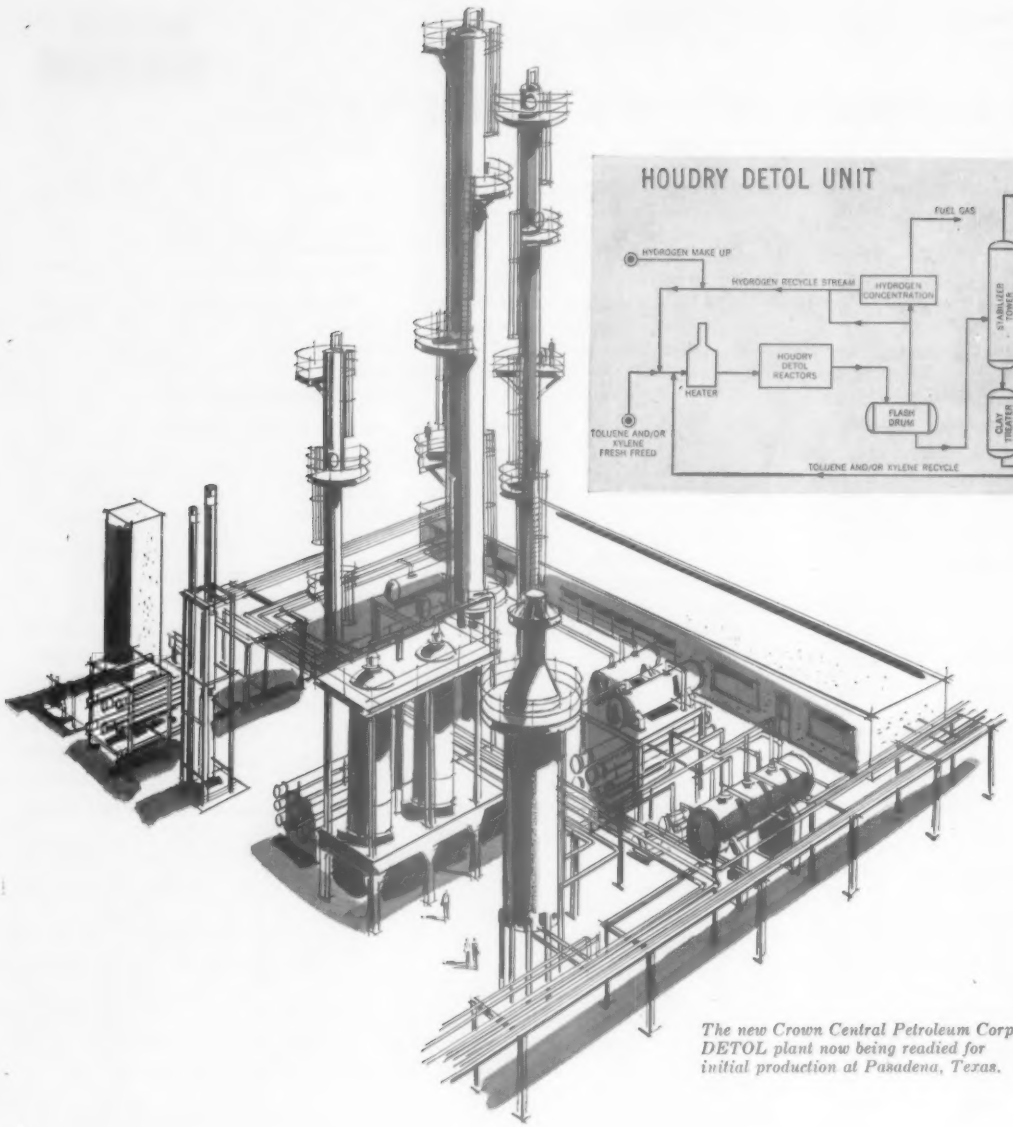
$$\$/\text{bbl.} = 107C + 535$$

These are based on average U. S. crude oil which contained about 0.63% sulfur in 1946 (only slightly more in 1958). Sulfur raises or lowers the refinery cost by about 10% for each 1% sulfur above or below 0.65%. But little increase occurs above about 2.5% sulfur.

TABLE 1—COMPLEXITY FACTORS FOR PETROLEUM REFINERY OPERATIONS

Process operation	Complexity factors—old	Complexity factors—revised	Approx. cost of process $/daily bbl. (1946)
Topping—shell still	0.8	0.8	$ ..
modern	1	1	*56.60
Thermal cracking	3	3	178
reforming	3	3	148
Viscosity breaking	2	2	96
Coking	8	5	290
Catalytic cracking	4	5	267
reforming	3	5	266
Polymerization¶	4	9	480
Alkylation¶	8	13	700
Desulfurization	4	2	115
Vacuum flashing	1	1	37
Lube manufacture¶	50	§62	§3,500
extra steam‖	..	4	‖250
extra storage‖	..	1	‖60
Vac. distillation‡	..	1	60
Deasphalting	..	5	290
Solvent extraction	..	4.5	260
Lube rerun#	..	1.5	#80
Dewaxing	..	9	540
Deoiling¶	..	10	540
Decolorizing oil and wax	..	6	350
Hydrofinishing	..	2	100
Blending and compounding			
oils	..	1	60
waxes	..	0.5	30
Wax forming and loading	..	66	3,755
Filling and loading			
cans and pails	..	10	570
drums	..	6.5	375
tanks cars	..	3	176
Light oil treating**	1	0.5	43
Asphalt	2	2	123
Naphthenic lubes¶	20	20	¶1,130
Specialties	20	5-35	280-2,000

*Includes desalting and 50% more for auxiliaries (not of a utility nature) found in every refinery. †Includes handling and a small amount of calcining. ‡Extra cost of distillation over the cost of vacuum flashing. §Weighted average of all items indented under Lube Manufacture. ¶Based on barrels product rather than feed. ‖Based on barrels of finished lube or wax rather than feed. #Based on solution. **Before 1940, light-oil treating plant complexity required factors of 1 and even 2.



The new Crown Central Petroleum Corp. DETOL plant now being readied for initial production at Pasadena, Texas.

Crown Central Petroleum chooses DETOL Process for new 17-million gal/yr benzene plant

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DETOL offers benzene yield from the reactor of 96.5 mol percent of fresh toluene charge, high selectivity with minimum loss to undesirable by-products. Benzene product will meet acid wash and corrosion tests, will have freeze point of 5.4°C. or better. Non-aromatics and organic sulfur in feed are converted to light hydrocarbons and hydrogen sulfide. Catalyst is not affected by sulfur. Operating costs are estimated at 1.63 cents per gal. of charge, in the Gulf Coast area, including labor, supervision, maintenance, utilities, catalyst and chemicals. More information will be furnished on request.

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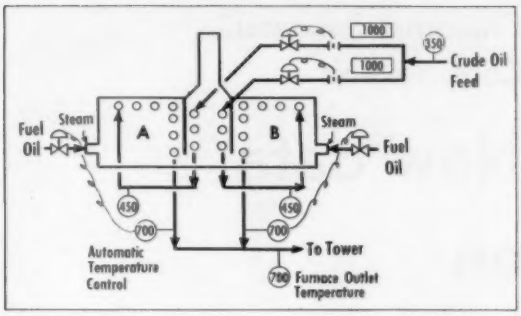
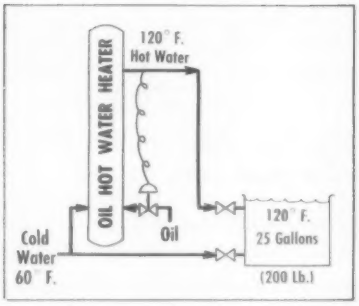
Here's a review of heat transfer, chemistry, and combustion principles





Question 1a: Joe takes a bath and uses 200 lb. of water (about 25 gal.). Joe likes his bath water at 120° F. and has his hot-water heater set to hold that temperature on the outlet. With cold water coming into the house at 60° F., how many B.t.u. of heat does the water heater put into Joe's bath water?

C_p of water = 1 B.t.u./(lb.) (°F.). In other words, it takes 1 B.t.u. to heat 1 lb. of water 1° F.

Answer 1a: Remember that the formula used to find the quantity of sensible heat transferred (Q) is $Q = M \times C_p \times \Delta T$.

Quantity of heat = Weight × Specific heat × Temperature change.

Q = 200 lb. × 1 B.t.u./(lb.) (°F.) × (120° − 60° F.)

Q = 12 M. B.t.u.

Question 1b: If Joe's heater is 75% efficient, how many pounds of heating oil will have to be fired if 1 lb. releases 16 M. B.t.u.?

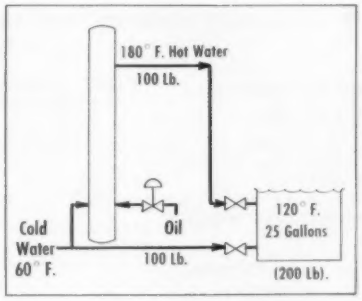
Answer 1b: An efficiency of 75% means that, for every 100 B.t.u. released by burning the oil, only 75 B.t.u. will go to heat the water. Answer 1a showed that it's going to take 12 M. B.t.u. to heat the water.

Heat into the water = 75/100 × heat released by the oil.

12 M. B.t.u. = 0.75 × Heat released by the oil.

16 M. B.t.u. = Heat released by the oil.

It will take 1 lb. of oil to provide this much heat.



Question 2: Joe starts thinking about this one day. He figures that if he sets the water heater to hold a hotter temperature (say 180° F.), it will allow him to mix one-half cold water at 60° F. with one-half hot water at 180° F. to give him his 120° F. bath. Since only half as much hot water is needed, Joe believes that he'll save fuel.

Assuming the same 75% heater efficiency, how much fuel will Joe save each bath by keeping the outlet of the hot-water heater at 180° F.? (1 lb. of heating oil = 16 M. B.t.u.)

Answer 2: He won't save any. Joe must heat 100 lb. of water from 60° to 180° F.

$Q = M \times C_p \times \Delta T$.

Q = 100 lb. × 1 B.t.u./(lb.) (°F.) × (180° − 60° F.)

Q = 12 M. B.t.u. required to heat the water.

Since the heater is 75% efficient, 16 M. B.t.u. must be released by the heating oil to provide the 12 M. B.t.u. required to heat the water. Therefore, it will still take 1 lb. of heating oil.

Question 3: We are maintaining a flow rate of 2,000 bbl. per hour through the above furnace. Furnace outlet temperature is 700° F. However, we cannot continue to operate as shown because the tube-metal temperature must be kept under 1,250° F.

Add:

Average tube-metal temperature
'A' Section—1,150° F.
'B' Section—1,260° F.

Firing rate
'A' Section— 80 M. B.t.u./hour
'B' Section—110 M. B.t.u./hour

Air rates to both sections same. No flame impingement occurs.

We need to make an adjustment, but we want to maintain both the 2,000-bbl. per hour feed rate and 700° F. outlet temperature for both "A" and "B" sections of the furnace. Which one of the following adjustments will probably result in an increased run length on the furnace before a shutdown is required?

. . . (a) Close down on damper

. . . (b) Send higher percentage of total feed through "A" section of furnace

. . . (c) Decrease fuel rate to "B" section of furnace

. . . (d) Increase steam to "B" section burners.

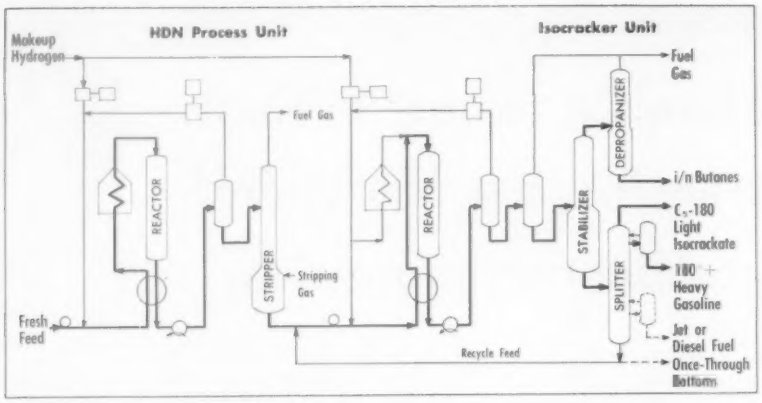
Answer 3: (b) Send higher percentage of total feed through "A" section of furnace.

Tube-metal temperatures are higher in "B" section because the tubes have coked up and the furnace must be fired much harder in "B" section to heat the oil. The best cure is to change the feed distribution.

This material taken from process-training-program manual, Bayway, N. J., refinery of Humble Oil & Refining Co.

California Research Corp. reveals

New data on isocracking



PROCESS FLOW for California Research's hydrocracking process. The flow scheme is similar to conventional hydrogen treating plus catalytic reforming.

- Bid prices from contractors show that costs will be about one-third less than those estimated a year ago.
- End-point limits on feed stocks have been raised.

BY J. A. ROBBERS
N. J. PATTERSON AND W. T. LANE

ISOCRACKING IS the first of the new hydrocracking processes to be placed in commercial operation. The 1,000-bbl. per day unit at Standard Oil Co. of California's Richmond refinery has been operating for almost 2 years.

Among the most significant developments which have occurred during the past year are:

... Distillation range of feed stock has been extended from heavy cracked gas oil to include heavy catalytic cycle oil and heavy California straightrun gas oil. Product cut points in commercial operation have ranged from 320° to 525° F., with extinction recycle of higher boiling material. Isocracking of these heavier feeds shows the flexibility of the process to produce low-freezing-point jet fuel as well as gasoline.

... Payout for a 7,000-bbl. Isocracker, after taxes, is estimated at 2.6 years. It was 3.3 years when similar studies were made a year ago. Payout in a comparable situation for catalytic cracking is 5.8 to 7.4 years.

Yield Data

Process flow for the Richmond Isocracker is similar to that shown in diagram. The plant has operated with makeup hydrogen from the catalytic reformers. Hydrogen purity ranges from 68 to 90 vol. %. Unstabilized isocrackate taken as the overhead stream from the splitter column is returned to the catalytic reformers.

Table 1 summarizes operations in the Richmond Isocracker when feeding 500°-855° F. heavy catalytic cycle oil from the FCC unit. These commercial plant yields correspond closely to similar data obtained in our pilot plants.

The whole isocrackate from the cycle-oil operation was split into a 350° F.-e.p. gasoline fraction and a 350°-500° F.-boiling-range jet-fuel stock. Detailed inspections of the jet-stock are shown in Table 2.

A 29-vol. % yield of this 112° F.-freezing-point kero-

Authors Robbers and Patterson are group supervisors, California Research Corp., San Francisco, and Lane is foreman, Standard Oil Co. of California, Richmond. Paper presented at forty-ninth annual meeting of WPRA, San Antonio, April 1961.

TABLE 1—RICHMOND ISOCRACKER OPERATING ON HEAVY CATALYTIC CYCLE OIL FEED FROM CALIFORNIA CRUDES

Inspections	Raw feed	Hydrofined stock	180°-350° F. isocrackate	350° F.+ Jet fuel
Gravity, °API	24.5	31.3	56.3	41.6
Aniline point, °F.	169	...	126.5	133.4
ASTM distillation, °F.	(D 1160)	...	(D 86)	(D 86)
Initial	557	...	213	332
10%	624	...	232	388
30%	652	...	241	397
50%	687	...	257	409
70%	717	...	278	424
90%	758	...	310	449
E.p.	855	...	323	485
Composition, volume %				
Paraffins	...	...	43.2	}
Naphthenes	...	...	46.1	} 79
Aromatics	...	...	10.7	21
Sulfur, wt. %	0.46	...	...	...
Nitrogen, p.p.m.	1310	...	...	...
Pour point, ASTM, °F.	+75	...	...	...
Freeze point, °F.	...	...	...	−112
RON clear	...	...	63	...
RON + 3 ml. TEL	...	...	81.8	...

Hydrogen consumption, S.c.f. per bbl. raw feed	
HDN process	970
Isocracker	1,440
Total	2,410

	Observed	Adjusted[1]
Plant yields:		
Hydrofined stock, vol. % of raw feed	104.9	...
Isocracker gas yields, wt. % of hydrofined stock:		
C_1	−0.5	0.01
C_2	−0.7	0.2
C_3	−0.6	0.6
Total	−0.6	+0.81
Isocracker liquid yields, vol. % of raw feed:		
iC_4	7.9	7.8
nC_4	3.1	3.1
C_5-180° F., light isocrackate	29.6	28.8
180°-350° F., heavy isocrackate	60.6	58.5
350°-500° F., jet fuel	29.2	28.7
Total	130.4	126.9

[1] Adjusted for material balance closure.

TABLE 2—INSPECTIONS OF JET FUEL PRODUCED FROM HEAVY CATALYTIC CYCLE OIL

Inspection	Method	Typical commercial airline specification	Plant results
Gravity, °API	ASTM D 287	37-57	41.6
Distillation, °F.	ASTM D 86	.....	....
10%	.....	400 max.	388
50%	.....	450 max.	409
E.p.	.....	550 max.	485
Flash point, °F.	ASTM D 56	110-150	115
Freezing point, °F.	IP-16B	−58 max.	−112 to −121
Viscosity, cs.	ASTM D 445	.....	.....
At 0° F.	.....	.....	4.8
At −30° F.	.....	15.0 max.	8.9
Sulfur, wt. %	ASTM D 90 or D 1266	0.3 max.	0.0004
Aromatics, vol. %	ASTM D 1319	20 max.	21
Smoke point, mm.	ASTM D 1322	25 min.*	19
Naphthalenes, vol. %	FS 3704T	3.0 max.	0.3

*Waived provided naphthalene content does not exceed 3.0 vol. %.

sine jet fuel was produced from the 75° F.-pour-point feed. Simultaneously, a 98-vol. % yield of C_4−350° F.-e.p. gasoline stock was produced. Higher yields of kerosine-type jet fuel can be made at the expense of gasoline production.

Plant yields indicate negative gas values or a disappearance of methane and ethane. Net gas yields are obtained by difference where the light hydrocarbons introduced with the makeup hydrogen are far greater than those produced by the Isocracking reactions. These negative yields can be attributed to slight inaccuracies in plant flowmeters. Methane and ethane yields shown in the adjusted-data column were estimated from pilot-plant data.

Table 3 shows the inspections of plant feed and the jet-fuel stock produced in a plant test program feeding 550°-880° F.-boiling-range heavy straightrun gas oil from California crudes. Complete inspections on the plant streams are now being obtained. These and resulting yields will be available later.

TABLE 3—RICHMOND ISOCRACKER OPERATING ON HEAVY STRAIGHTRUN GAS OIL

Inspections	Raw feed	Hydrofined feed	350 °F.+ jet fuel stock
Gravity, °API	22.0	28.2	39.8
Aniline point, °F.	147.2	150.6	127.9
Distillation, °F.	(D 1160)	....	(D 86)
Initial	532	....	356
10%	651	....	371
30%	687	....	387
50%	715	....	409
70%	745	....	437
90%	785	....	475
E.p.	880	....	503
Composition, L.V. %			
Paraffins + naphthenes	...	....	78
Aromatics	...	....	22
Sulfur, wt. %	0.70	....	...
Nitrogen, p.p.m.	2,150	....	...
Pour point, °F.	+35	....	...
Freezing point, °F.	...	....	−88.6

TABLE 4—PROCESS PLANT INVESTMENT, 7,000 BBL. PER OPERATING DAY LIGHT-CYCLE-OIL FEED, CALIFORNIA CRUDE

	HDN process ($)	Isocracker extinction recycle ($)
1. Direct labor and material		
a. Reactor section—Includes feed pump, heat exchange, charge heater, makeup hydrogen and recycle compressors, reactors, and flash drums	1,050,000	1,700,000
b. Recovery section—Includes stabilizer, depropanizer, recycle splitter, and side-cut stripper	(*)	720,000
2. Indirect field expenses—Includes erection contractor's fee, contractor's field office expense, construction equipment rental, hand tools and consumable supplies expense, and temporary lines and buildings	.....	.....
Total process plant investment	1,350,000	2,880,000

*Product stripper included in reactor section.

Investment and Operating Costs

Engineering studies have led to substantial reductions in the investment and operating costs reported previously. Investments for a 7,000-bbl. per operating day HDN (hydrogen treating) process and Isocracking unit feeding California catalytic cycle oil are shown in Table 4. The totals exclude off-plot facilities, catalysts for the first plant charge, and design engineering expenses.

Utility requirements and estimated operating costs are shown in Table 5 for the same cycle-oil plant. Investment and operating costs include hydrogen makeup compressors. Availability of an 85%-purity hydrogen stream at battery limits at 300 psig. has been assumed in estimating the compression requirements.

TABLE 5—HDN PROCESS UNIT AND ISOCRACKER OPERATING COSTS. 7,000 BBL. PER OPERATING DAY LIGHT-CYCLE-OIL FEED, CALIFORNIA CRUDE

		HDN Process		Isocracker Extinction Recycle to 400° F.	
	Unit cost $	Consumption	cents/bbl.	Consumption	cents/bbl.
Utilities					
Fuel, B/D-EFO	2.00/bbl.	60	1.7	305	8.7
Power, kw.	0.008/kw.-hr.				
Compressors		870	2.4	2,620	7.2
Pumps and lights		280	0.8	750	2.0
Deaerated condensate, lb. per hour	0.03/M. lb.	8,500	0.1	...	...
150 psig. steam, lb. per hour	0.47/M. lb.	...	...	4,600	0.7
Cooling water, g.p.m. (85°-120° F.)	0.02/M. gal.	510	0.2	3,300	1.4
Subtotal			5.2		20.0
Catalyst and chemicals			6.4		10.3
Labor					
Direct labor (operators)		(One)	1.3	(Two)	2.6
Supervision			0.7		0.7
Analytical and tech. service			0.7		0.7
Subtotal			2.7		4.0
Maintenance 4% of investment			2.4		5.0
Plant overhead 15% of labor and maintenance			0.8		1.4
Property taxes and insurance 2½% of investment			1.5		3.1
Total, cents per bbl.			19.0		43.8
$/operating day			1,330		3,070

In the engineering-construction field

Only Scientific Design MAKES NEWS in the

Only SD – designer and concentrates

In its first 15 years
Scientific Design Company has designed or constructed 91 chemical plants in 12 countries for 61 companies, employing 25 chemical processes almost all of which were developed by SD

Company continually world chemical industry

builder of chemical plants – also on the development of chemical processes

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ETHYLENE OXIDE—SD's direct air oxidation process accounts for 20 plants in 8 countries for 14 companies. About ⅓ of the world's ethylene oxide capacity, nearly 700,000,000 pounds per year capacity.

MALEIC ANHYDRIDE AND FUMARIC ACID—SD process accounts for 19 plants in 8 countries for 17 companies. About ⅖ of world's maleic anhydride capacity, 250,000,000 pounds per year capacity.

PHTHALIC ANHYDRIDE—4 plants for 3 companies in 3 countries. Plus NEW ortho-xylene convertible catalyst shifts economics of phthalic anhydride in favor of ortho-xylene.

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OXIDATION OF XYLENES—by the fundamentally new M-C Process (once an SD affiliate)—5 plants in 3 countries for 5 companies. Terephthalic acid, isophthalic acid, phthalic anhydride, trimellitic anhydride.

NEW ADIPIC ACID PROCESS—by air oxidation of cyclohexane—1 plant.

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SIMPLIFIED LOW COST POLYVINYL CHLORIDE PLANTS—10 plants for 8 companies. About ⅓ of U. S. capacity made by SD licensees.

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New Isomerization and Crystallization Techniques for Manufacture of Ortho-Xylene, Para-Xylene, Ethylbenzene, from Mixed Xylenes

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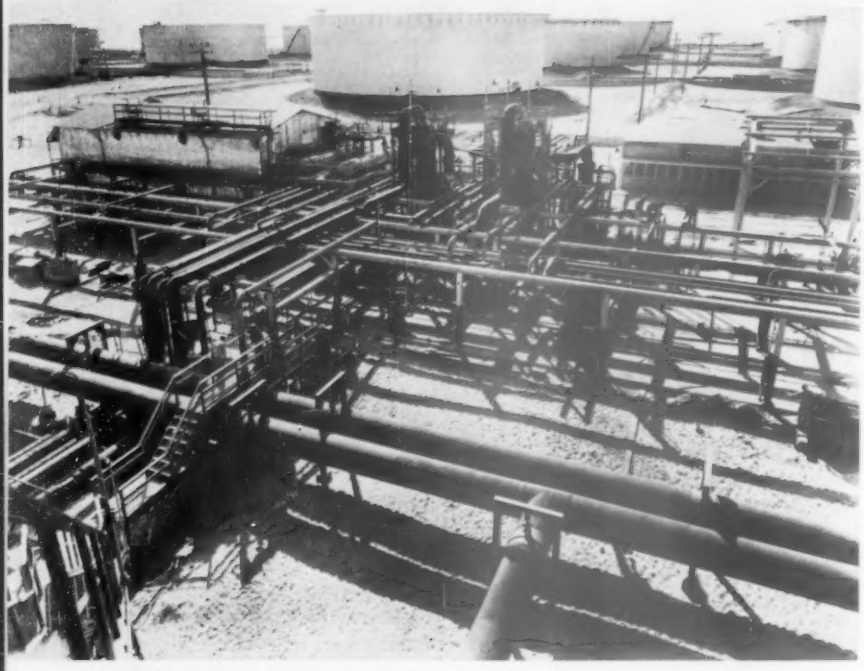


REFRIGERATION FACILITIES being built at Ras Tanura by Aramco will supply liquefied propane and butane for shipment by tanker to world markets. In this view, compressor shed is at left, flash towers are in center, and operations office is at right.

Refrigerated-LPG plant under construction in Ras Tanura

THE WORLD'S FIRST plant specifically designed to make fully refrigerated liquefied petroleum gas (LPG) available for tanker shipment is now under construction at Ras Tanura, Saudi Arabia.

The $7,000,000 plant, being constructed by the Arabian American Oil Co., will supply 4,000 bbl daily of high-purity propane, butane, or a blend of the two. The LPG is a product of Aramco's Ras Tanura refinery located 7 miles northwest of the storage facilities and refrigeration plant.

Storage. In the past, these gases were maintained in a liquid state by high pressures. However, by holding them at very low temperatures the same results can be achieved at much lower pressures. This procedure reduces the cost of pressure vessels which must have thick walls to withstand the higher pressures. For example, to realize the 210,000-bbl. capacity soon available in three refrigerated storage tanks at Ras Tanura, seven 30,000-bbl. pressure vessels would be required at several times the cost of the comparatively simple refrigerated tanks.

The propane will be held in storage at −43° F. and the butane at 0° F. With outside temperatures reaching as high as 120° F., an important factor was the choice of insulation for the tanks. As a result of comparative evaluations, cellular glass insulation was chosen to meet the stringent requirements. The selected material, called "Foamglas," is produced by Pittsburgh Corning Corp. A high-strength glass foam consisting of countless sealed cells, it is unaffected by most acids and solvents, and impervious to moisture.

Operation. After purification, the gas will be liquefied under pressures of 250 psi. for propane and 100 psi. for butane, and stored temporarily at the refinery.

Pumps will then move the gas through pipelines to the new plant. Here, two 765-hp. compressors will liquefy the gas through compression and autorefrigeration. The gas will be compressed to 250 psi., vaporizing and condensing it with water to remove heat. From a series of flash towers and condensers, it will pass through insulated piping to the three huge storage tanks. Here, the −43° and 0° F. temperatures will be maintained by recirculating vapors back through the compressors, flash towers, and condensers.

It is believed that refrigerated tankers to carry the liquefied gases to world markets will be in operation in late 1961.

Radiotracers remove feed contaminants

ONE of the problems in automating processes is that it is often difficult to obtain accurate and continuous information on the composition of the process stream.

One answer to this problem is to add intrinsic radiotracers—radioactive isotopes of the chemicals being processed.

Scientists at Batelle Memorial Institute have used the intrinsic radiotracer technique in two pilot operations: removal of iron from a mixed nickel-cobalt stream and removal of manganese from process feed water. Research is currently being conducted on applying the technique to remove cadmium from zinc sulfate electrolyte.

In the iron-precipitation process,

radioactive iron-59 is added to the feed solution. The level of radioactivity in the feed solution is continuously compared to the level of radioactivity in the filtrate to show what proportion of the iron is being removed at any time. A similar procedure is followed with the manganese and cadmium-removal processes.

Continuous information on the composition of chemical process streams is presently provided by measuring such physical properties as density, electrical conductivity, oxidation potential, refractive index, X-ray absorption, and infrared, ultraviolet, and visible light absorption.

But there are many areas where improvement is needed. In many cases instrumentation is expensive and current instruments are not readily adaptable to plant conditions. Also the process may be so complex, physically and chemically, that it is difficult both to make the measurements and interpret the results.

Intrinsic radiotracers offer a number of advantages for process control. They have exactly the same chemical behavior as ordinary chemicals in the process. Their radioactivity is not influenced by physical or chemical properties of the system. Extremely small quantities of radioactive isotopes can be accurately measured by modern detection devices which can be used to provide a continuous control signal. Radioisotopes can simplify stream analysis and would be particularly useful where hot, corrosive, or toxic material are involved.

The technique is safe. Use of short half-life radioisotopes virtually eliminates radioactivity-contamination problems. Direct radiation exposure for personnel is well below the maximum amount permitted for safe operation.

Tankers, barges loaded by gravity

TANKERS and barges are loaded by gravity at Suntide Refining Co.'s new loading docks at the head of Corpus Christi's ship channel.

The loading tanks are on a 36-ft.-high bluff overlooking the new docks and turning basin. The spot is Nueces County's highest point.

Tankers and barges are loaded at rates of 15,000 bbl. hourly. The new docks, one for supertankers and the other for barges, are served by 12 lines with sizes ranging between 8 and 24 in.

Before the new docks were opened, Suntide pumped liquids to a dock 8½ pipeline miles from the refinery.

Gravity loading offers several safety advantages. Risk of breaking the rubber loading hoses is less with a lower pressure. Also, there is no pump to shut down when valving off a loading line.

GRAVITY LOADING at Suntide's new docks offers less risk of loading-hose rupture and eliminates bother of starting and stopping pumps.

The Channel Extension

Suntide guaranteed money for construction and maintenance of the channel and docks. The extension is 2.1 miles long. Initial bottom width is 125 ft. and depth 34 ft. The turning basin is trapezoidal in shape and measures 800 by 1,200 ft.

Total cost for the channel extension and new docks was $1,315,-167. Federal funds will be used later to widen the channel to 250 ft. and deepen it to 40 ft.

Suntide loaded the first tanker at the new dock on January 17.

Esso develops improved butyl rubber

AN IMPROVED VERSION of butyl synthetic rubber has been developed by Esso Research & Engineering Co.

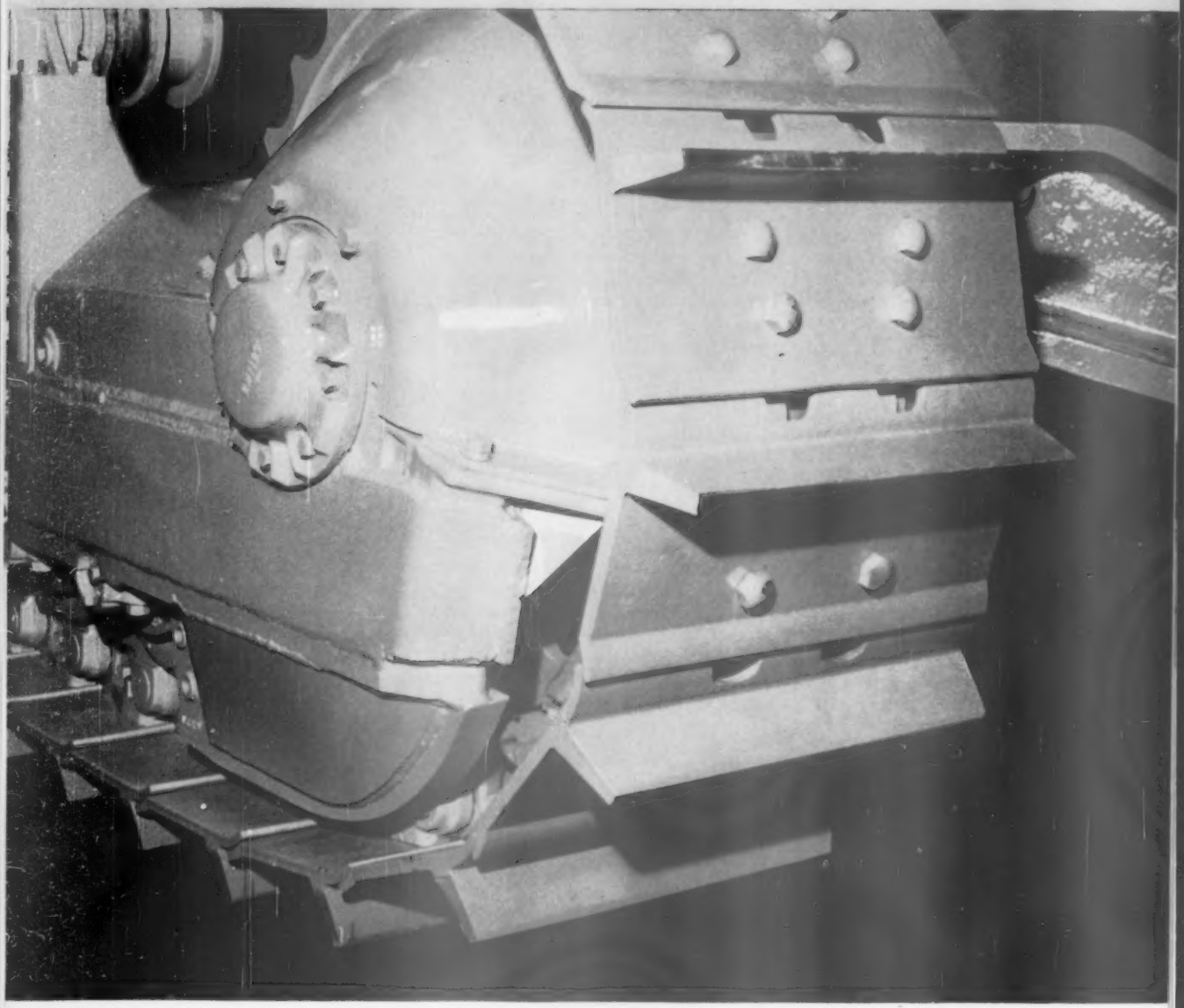
A major feature of the new material is its much greater resistance to high concentrations of ozone in the atmosphere than any other commercial general-purpose rubber, synthetic or natural.

Esso revealed no details about the new material other than saying that because of its unusual molecular structure, the new rubber is capable of sustaining large loadings of fillers and plasticizers. This permits processors to "stretch out" a given volume without sacrificing the basic quality.

The rubber can be manufactured in existing butyl plants, and can be processed into finished goods in the same manner as other types of rubber, and more easily in some cases.

In putting up buildings, this new butyl should be vary useful in curtain walls, and for sealing around the edges of glass and panels. Other typical applications include automotive weather stripping and seals, electrical insulation, extruded and molded sponge, and other molded goods such as hose and tubing.

385 HP! FROM CATERPILLAR THE NEW D9G



MASSIVE HEAVY-DUTY UNDERCARRIAGE Immense strength and rigidity of undercarriage is one good solid reason why the D9G is more than equal to the roughest ripping job. Box section frame is wider and deeper than previous models. Hydraulic track adjusters are standard. Lifetime lubricated rollers with special alloy deep hardened rims assure long life . . . and they require no servicing until time to rebuild.

HIGH-PRODUCTION DOZER, PUSHER, RIPPER

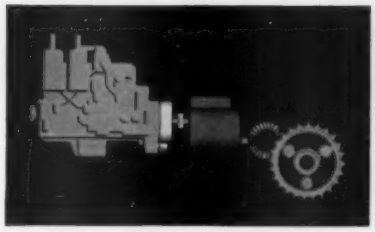
For high-volume dozing, pushloading or ripping, the new D9G has what it takes . . . at minimum cost per yard!

The engine in the new D9G delivers 385 flywheel horsepower. That's *100 more horsepower* than the first D9 introduced five years ago!

Weight is 64,800 pounds—14% more than the first D9!

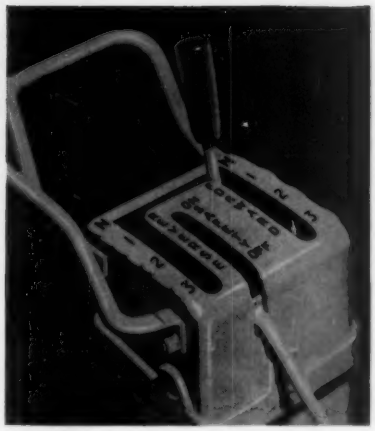
Torque divider power shift transmission . . . massive heavy-duty undercarriage . . . and power train with built-in ruggedness for long life.

What else is new? Matching the D9G is a full line of attachments—all designed to help this new tractor really put out on the toughest big jobs.



CAT D353 ENGINE AND MATCHED POWER TRAIN This engine, rated 385 HP (flywheel) at 1330 RPM, has been proven—and proven again—over thousands of hours on the roughest jobs. Its 6.25″ x 8″ six-cylinder design now incorporates *controlled turbocharging* and aftercooling (found only in the D9G among crawler tractors), assures more efficient use of fuel, increases maximum torque and provides fast engine response over a wide range of operation. Shroud-mounted fan reduces air recirculation; torque limiting clutch saves on fan horsepower. Plus: exclusive Caterpillar fuel injection system, twin dry-type air cleaners, oil-jet-cooled pistons, "Hi-Electro" hardened cylinder liners and crankshaft journals.

The new power train includes three major advances: *new oil-cooled steering clutches and brakes, new planetary final drives*, and a time and cost saving *common lube system*. The new spring-engaged, hydraulically-released steering clutches need no adjustments . . . have a proven longer service life. New, planetary final drives increase gear reduction ratios from 8.8:1 to 18:1, reducing torque load on all power train components. A common system cools and lubricates torque divider, transmission, bevel gear, steering clutches and brakes. This means one service point . . . one type of oil. The entire power train of the big new D9G has unitized construction for fast, individual removal of components.



PROVEN TORQUE DIVIDER POWER SHIFT This exclusive Caterpillar design feature—standard equipment on the D9G—combines the efficiency and snap of direct drive with the load-matching and anti-stall characteristics of torque converter. A single lever gives the operator finger-tip control of his machine. It adds up to fast cycle times and greater efficiency. You get more out of the machine *all day*.

A FULL LINE OF HIGH-PRODUCTION ATTACHMENTS New cable controls with larger clutch, brake and drum capacities—hydraulically boosted . . . new hydraulic controls in nine arrangements . . . special cushioned pushing equipment . . . angle, straight and U dozers, cable or hydraulic . . . rippers . . . scrapers . . . and others.

To prove the D9G's productive capabilities on your job, talk to your Caterpillar Dealer.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

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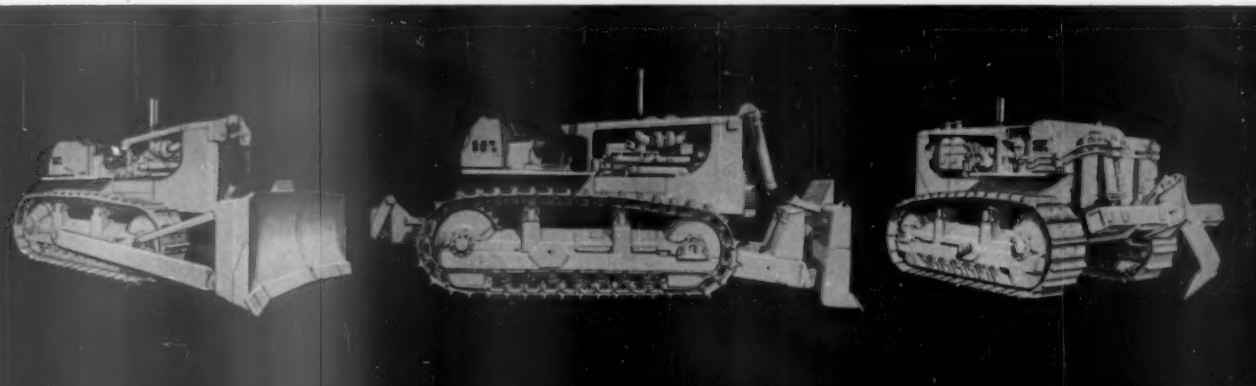
NEW D9G—BIG, POWERFUL, PRODUCTIVE



Any way you look at Roebling Royal Blue Wire Rope, there's real savings in it for you. In its inner and outer uniformity. In its *extra*-high strength. In unison, these qualities provide unrivalled resistance to abrasion, impact, crushing and tough sheave pressures. Royal Blue—inside and outside—goes on paying off for you when lesser wire rope would need replacing. Find out more from your wire rope distributor, or write for free booklet to Roebling's Wire Rope Division, Trenton 2, New Jersey.

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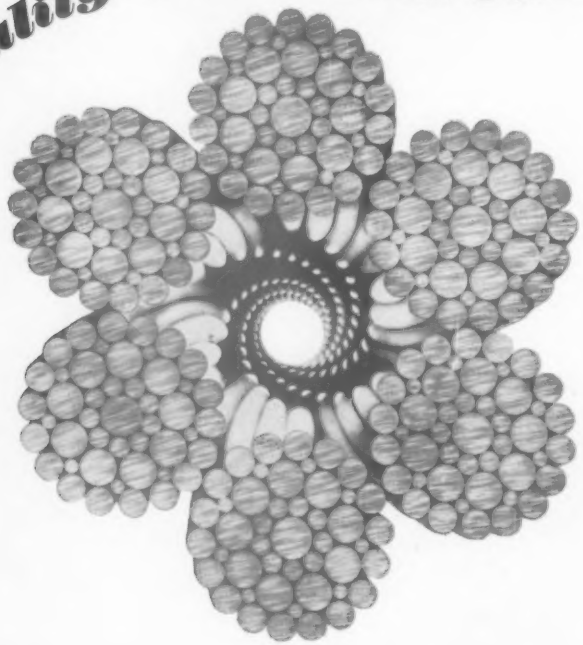

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Multiple rod pumping

BY JOSEPH ZABA

CHARACTERISTIC feature of a multiple-rod pumping installation is that one prime mover operates two or more pumping wells, the arrangement being such that downstroke load of one well is used to counterbalance the upstroke load of another well. Two types are involved, the backside-pumping and the central-pumping-power installations.

In the original series of these articles the subject was treated in considerable detail. Now the method, used for pumping of shallow small-volume wells, is practically obsolete, having been replaced by small individual pumping units. Nevertheless, in certain old, shallow fields, this type of installation is still in operation. For this reason and as a matter of general interest the subject will be summarized briefly.

Rod lines. In multiple pumping installations power is transmitted from prime mover to remote wells by means of "rod lines," sometimes referred to as "pull rods." Since they are common to both the backside and to central-power pumping and since their behavior affects the operation of the whole system, the rod lines must be first considered.

Rod lines are ⅝ to 1-in. steel rods ranging in weight from 115 to 295 lb. per 100 ft. They are strung on the ground supported by rod carriers of different types and designs. Purpose of the carriers is to reduce the friction during the reciprocating horizontal movement of the rods. Selection of the types of carriers used is a compromise between efficiency of reducing friction and economy.

Probably the most economical method of reducing rod friction is by installing rod lines in the form of the so-called "catenary sags." If a cord is suspended between two points of support the shape the cord will assume is called the catenary curve. If a rod line were installed this way, then, theoretically, all the friction could be eliminated between the rods and the carriers. However, it is not always possible to do this. Therefore, only a **reduction** in friction can be expected. Also, the method is adaptable only over gently rolling terrain and the reduction of friction occurs only during the upstroke portion of the cycle. During the downstroke the friction is increased. Formulas have been presented for design of rod lines in catenary sags.[1 2]

In a system of rod lines operating a number of wells from one prime mover, certain equipment items are used to change the direction of lines, increase or decrease the stroke, or provide needed additional counterbalance. These devices, such as swings, holddowns, reducers, and others must be properly rated and installed.

For calculations of loads, torques, and power requirements we use the so-called "rod-line pull." This pull is a sum of well loads, rod-line friction, and rod-line inertia.

Well loads are calculated the same way as in individual pumping installations except that in transferring the well load to the rod lines the leverage of the pumping jack must be considered. The well-load component of the rod-line pull equals the well load times the "jack ratio" which is the ratio of the polished-rod stroke to the rod-line stroke. The friction of rod lines depends on size and velocity of travel, on types of carriers, methods of lubrication, and topography.

For average conditions the coefficient of friction of rod lines is considered to be 0.2 to 0.3.[3 4] This means that for each 1,000 lb. of rods a pull from 200 to 300 lb. is needed to overcome friction. In calculating rod-line inertia the acceleration factor of the well-load formula may be used. The maximum and the minimum rod-line pulls may be then expressed by formulas:[3]

$$RLP_{max} = PRL_{max} \times J + 0.2W + W(1/J)(S \times SPM/5{,}400) \quad (1)$$

$$RLP_{min} = PRL_{min} \times J - 0.2W - W(1/J)(S \times SPM/5{,}400) \quad (2)$$

Where:

RLP_{max} and RLP_{min} = maximum and minimum rod-line pulls, lb.

PRL_{max} and PRL_{min} = maximum and minimum polished-rod loads, lb.

J = jack ratio

W = weight of rod line, lb.

S = polished-rod stroke, in.

SPM = strokes per minute

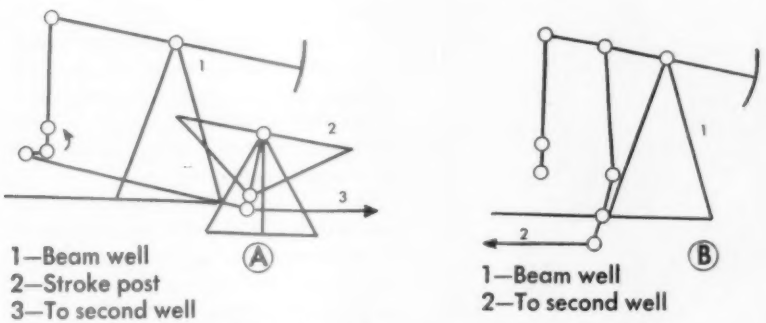
The minimum rod-line pull is available for counterbalancing.

Backside pumping. Of several possible variations of backside pumping we will consider only the case in which a conventional pumping unit, pumping one well, also operates a pumping jack of another well. Power is taken off the pumping unit either through a backcrank, Fig. 55-A, or directly from the beam, Fig. 55-B.

Since in the case of the beam well no rod line is involved and since the beam well operates usually with a longer stroke than the pumping-jack well the torques created by the two wells will not be equal. To assure smooth operation the net torques during each of the two halves of the revolution of the crank will have to be counterbalanced. Net torques on the reducer for the combination of loads of the two wells can be expressed by equations:

$$T_1 = RLP_{max}(S_1/2) - W_{min}(S_2/2) \quad (3)$$

$$T_2 = W_{max}(S_2/2) - RLP_{min}(S_1/2) \quad (4)$$



BACKSIDE PUMPING for two wells. Fig. 55.

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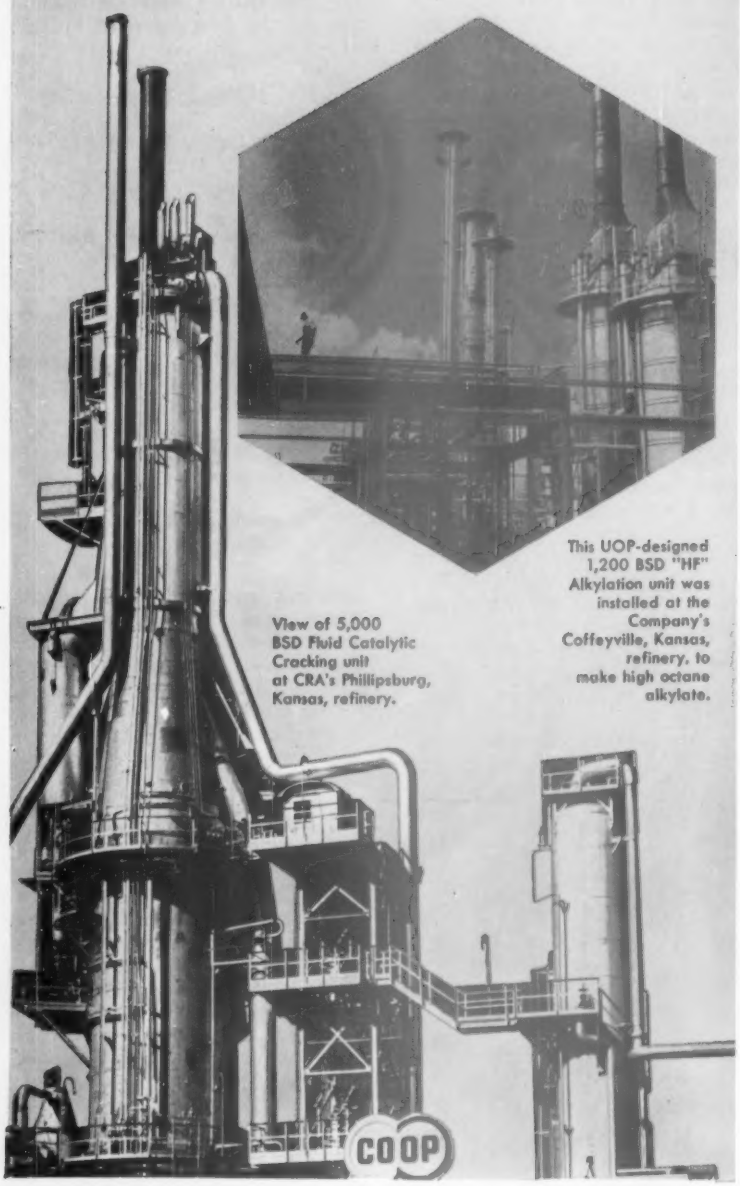


This UOP-designed 1,200 BSD "HF" Alkylation unit was installed at the Company's Coffeyville, Kansas, refinery, to make high octane alkylate.

View of 5,000 BSD Fluid Catalytic Cracking unit at CRA's Phillipsburg, Kansas, refinery.

First U.S. Co-op Refinery Founded on UOP Technology

By Bruce H. McCully
General Manager
Consumers Cooperative Association
Kansas City, Missouri

Bruce H. McCully

Since 1940, when we placed our first refining units on stream we have relied on UOP to provide the processes necessary to manufacture top-quality petroleum products. Catalysts and technical services in conjunction with the UOP processes have been an important aid in helping us produce economically the highest quality petroleum products.

During our earlier years, CCA often experienced difficulty in obtaining consistently high quality refined products from suppliers. This greatly influenced our decision to refine our own crude through a subsidiary, Cooperative Refinery Association. Constantly striving to increase both quantity and quality of refined products consistent with demand, CRA has achieved product quality through the installation of modern petroleum processing equipment.

Refining Started in 1940

The Phillipsburg plant, placed on stream in 1940, is not only CRA's first refinery, but it is the nation's first cooperatively-owned petroleum processing plant. Charging between 11,000 to 13,000 BSD of crude oil, this refinery employs UOP processes producing products marketed to Midwest farmers.

UOP processes at Phillipsburg include a 5,000 BSD Fluid Catalytic Cracking unit with gas concentration facilities, a 750 BSD Catalytic Polymerization unit, a 3,500 BSD Unifining* unit and a 2,500 BSD Platforming® unit.

The FCC and polymerization units were placed on stream in 1953 to satisfy growing farmer demand for increased quantities of high octane gasoline. As the octane race continued its upward spiral, CRA added Unifining and Platforming in 1958.

During the same year, a 1,200 BSD "HF" Alkylation unit was added to our Coffeyville refinery. Also at the 25,000 BSD Coffeyville refinery are these units: A 9,000 BSD Fluid Catalytic Cracking unit with gas concentration facilities, a 2,400 BSD Unifining unit, a 4,500 BSD Platforming unit and a 1,000 BSD Catalytic Polymerization unit.

In addition to these units at Coffeyville for producing gasolines and middle distillates, we produce lube oils, wax, heavy fuel oil, asphalt and coke from our furfural, vacuum and coker units.

The 3,000 BSD refinery at Scottsbluff, although small in comparison to the Phillipsburg and Coffeyville installations, utilizes a revamped thermal cracking unit and a 750 BSD Platformer to produce quality Co-op brand gasoline.

Fuels for Farmers

The bulk of our refined fuels are distributed to farmers through more than 1,700 local cooperatives serviced by CCA and CRA. CCA is the central manufacturing and distributing organization for these cooperatives covering a marketing area of all or parts of eleven states.

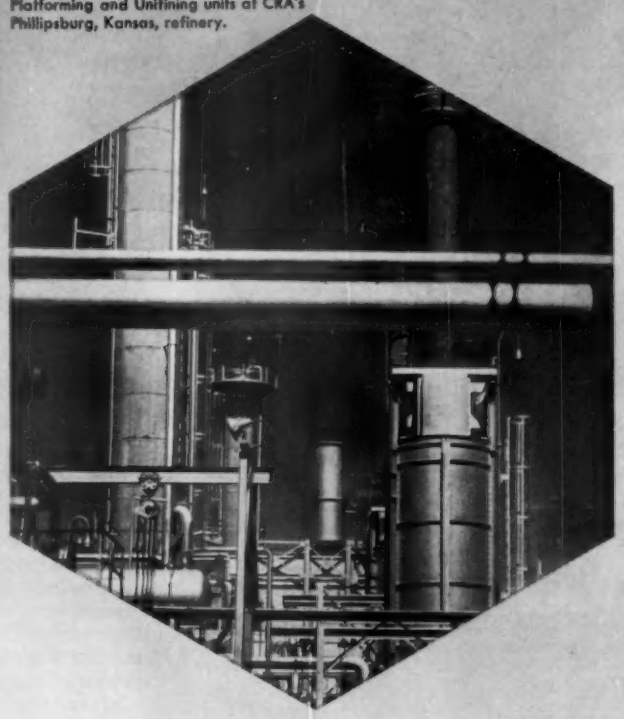
Although the majority of CRA's refined fuels are sold to farmers through tank truck delivery services, the member associations do operate a number of Co-op brand service stations. Refined products not absorbed by the farm market through these associations are sold through jobbers.

Movement of Co-op brand products is handled by a transportation fleet of 107 tractors, 49 transports, 15 LPG transports and 49 freight vans. This rolling fleet hauled 164,000,000 gallons of refined fuels and 88,320 tons of merchandise during 1959. Rounding out the transportation picture are nearly 1,000 miles of gathering and trunk pipelines in Oklahoma, Kansas and Nebraska.

Cooperative Trend Spurs Growth

The story behind CCA's rapid growth extends into the many hundreds of communities where member associations are situated. It is a story of growth for retail cooperatives as well as for the central wholesale and manufacturing organization. Over the years, this growth has been backed by the improvement of CRA's processing methods to consistently permit the marketing of quality petroleum products. And clearly a part of this progress are the contributions of UOP technology working hand-in-hand with CRA to achieve its goals.

Platforming and Unifining units at CRA's Phillipsburg, Kansas, refinery.



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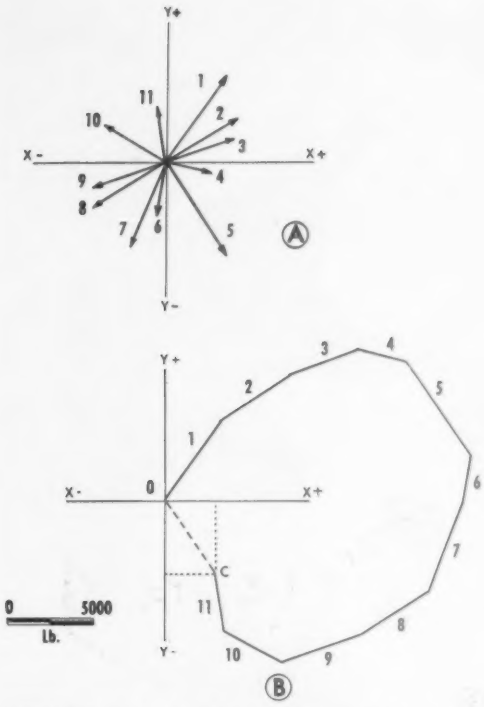

ANALYSIS of loads of a central pumping power. Fig. 56.

Where:

T_1 and T_2 = peak torques imposed by each of the two wells, in.-lb.

S_1 = rod-line stroke, in.

S_2 = crank stroke of the beam well, in.

W_{max} and W_{min} = maximum and minimum loads of the beam well, lb.

RLP = rod-line pull of the jack well.

The necessary counterbalance torque would equal half of the difference of the two torques. Counterbalancing is effected either by counterbalanced crank or by counterbalanced stroke post.

J. C. Slonneger suggested the following formula for calculation of power requirements of a backside pumping installation:[3]

$$HP = P \times D/66{,}000$$

Where:

HP = power required, hp.

P = production, bbl. per day

D = pumping depth, ft.

The formula assumes that the prime mover has sufficient flywheel effect so that average power requirements can be considered.

Central pumping powers. For a property with a large number of shallow wells with small, settled production, pumping with a central power of the bandwheel or geared type used to be the accepted method of production. In this type of installation the important considerations are proper location and proper balancing of the central power.

Proper location of the power simplifies the problem of keeping the power in balance since it eliminates one-sided loads and simplifies the arrangement of the rod lines to equalize uneven torques. An approximate method of finding proper location of power consists of spotting, to scale, on a stiff cardboard the locations of wells to be served by the power. Holes are then punched at each location and weighted strings are passed through each hole. The weights attached to the strings are either equal or they are proportional to the well loads, if data are available. The center of gravity of the cardboard, determined by trial and error, is an approximate location of the power. A graphic method has been developed for delineating the area within which the power should be located for given conditions.[5]

Proper counterbalancing reduces power requirements and wear of gears, belts, and prime mover of a central power. It also assures better operation of the rod lines. Balance conditions of a central power change during its useful life through changes in the number of wells and in individual well loads. Frequent checks on balance conditions of the power are therefore needed. Details of five of the methods of checking of balance conditions of a central power have been given in the original series of these articles in the March 9, 16, and 23, 1944, issues of The Oil and Gas Journal. Only a general outline of procedure will be given here.

The first step is to find the forces acting on the power. This is done with a rod-line dynamometer or by calculating the rod-line pulls with formulas given above. The second step is to find the effect of these forces on the central power. This is done graphically, Fig. 56-A. The third step is to determine the rearrangement of forces needed to bring about proper balance conditions.

In Fig. 56-B a polygon of forces has been constructed, the vector O-C, needed to close the polygon, representing the degree of unbalance. Now in Fig. 56-A forces must be found, the components of which equal approximately half of the corresponding components of vector O-C, and are of the same algebraic sign. These would be the forces 2 and 7 in Fig. 56-A. If they could be transferred in such a way that they would act in direction exactly opposite to their original direction the power would be in a relatively good balance. Sometimes such a rearrangement is not possible and change in pumping schedule or use of counterbalance dummies must be resorted to.

The above analysis deals with loads and balance. Investigation of torque conditions is more complex because for each position of the power's crank each of the wells served by the power is in a different phase of its pumping cycle. The methods mentioned above offer means for coordinating well loads for different crank positions.

Power needed at the central power is the sum of power needed at each well, of power needed to overcome friction of rod lines, and of power losses within the central pumping power. The efficiency of a bandwheel power was estimated as being about 60%.[6] From 5 to 10 hp. is estimated to be necessary to overcome the losses within the geared power.[7] If torque analysis of the installation has been made, data are available for calculation of power requirements of the cycle.[8]

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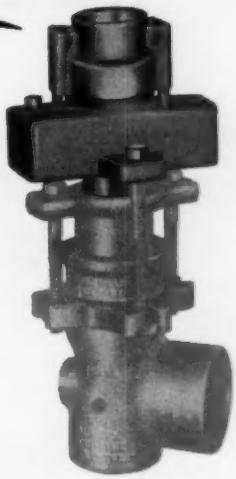

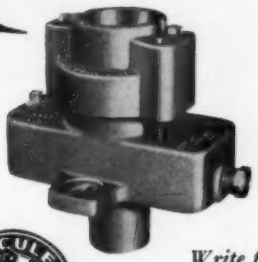

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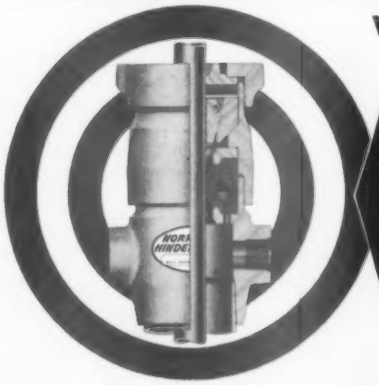

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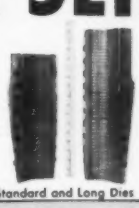

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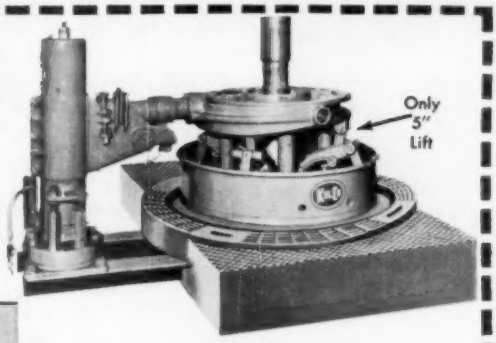

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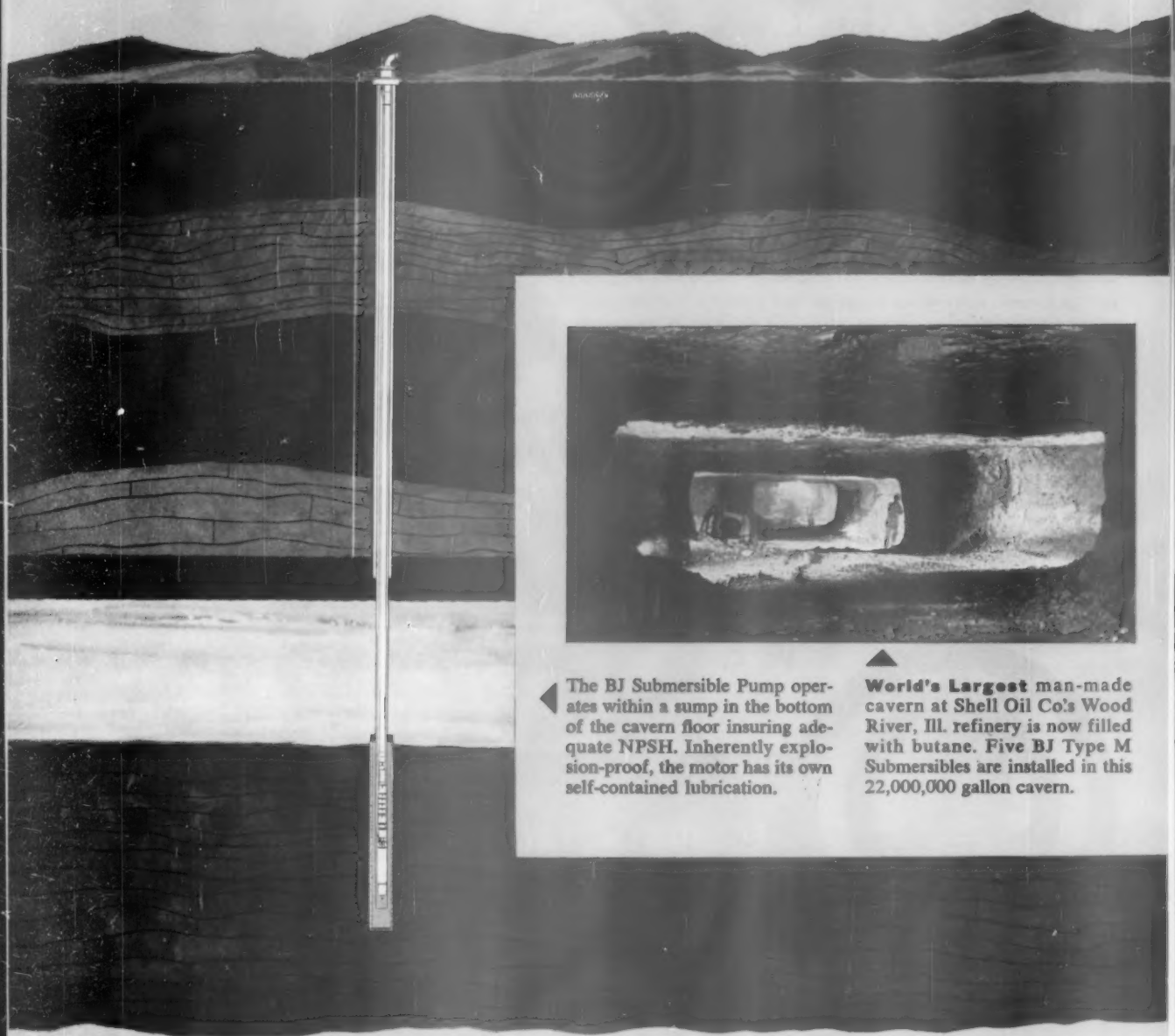

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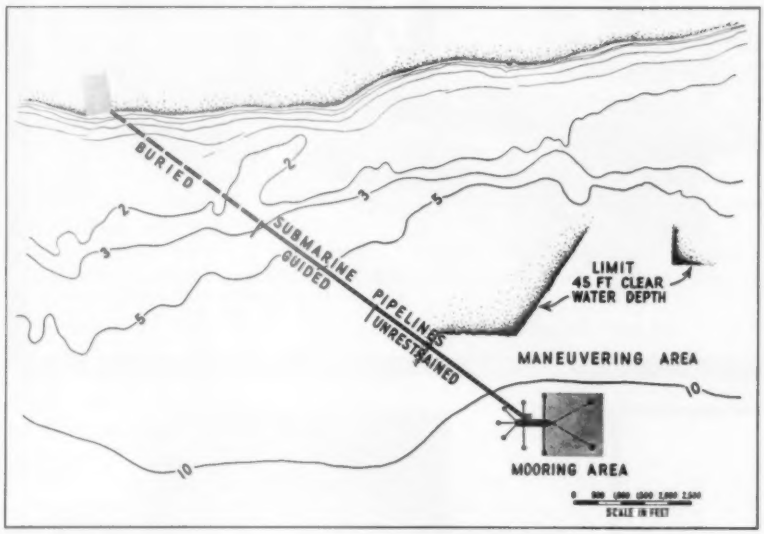
Coral is problem in Oahu terminal

Both crude oil and bunkering lines to California Standard's offshore mooring have heating lines pretensioned to prevent expansion, possible buckling.

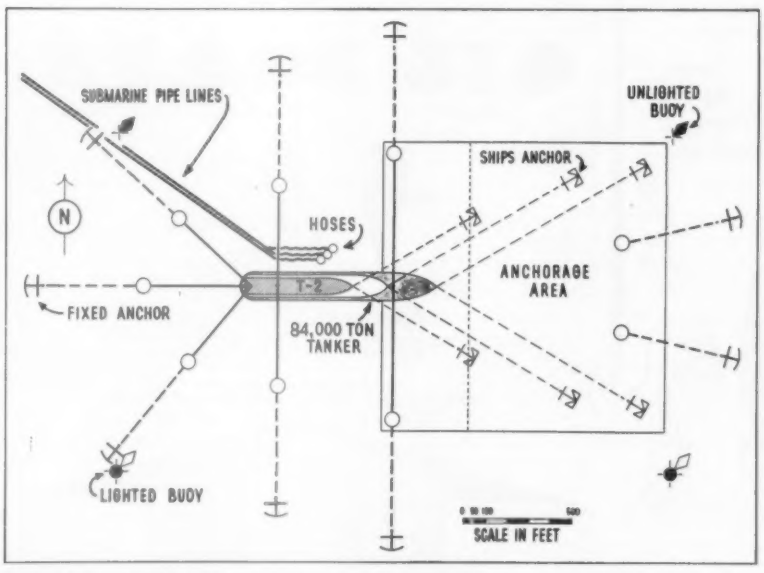
ALL THE USUAL, and some unusual, problems were encountered by the Standard Oil Co. of California when it installed the submarine pipeline system and sea terminal for its new refinery at Barbers Point, Oahu, Hawaii.

As the principal supply facility for this refinery, the submarine pipelines and terminal must:

1. Moor the largest tankers now afloat or contemplated, as well as the common T-2 class of tankers.
2. Receive a variety of crudes from the East Indies, Saudi Arabia, Iran, and other sources. Some of these crudes are waxy, with high pour points; they must be heated for delivery through a submarine line, even at the water temperatures of Hawaii.
3. Receive and ship heavy oils as fuel components or blending stocks. Some transfers with Socal's Pacific Coast refineries are expected.
4. Occasionally receive and ship clean specialty products.
5. Bunker tankers transporting crude to the refinery. The bunker fuels also require heating for efficient loading through a submarine line.



HAWAIIAN TERMINAL is located in water 70 ft. deep to accommodate largest tankers and to provide area for emergency maneuvering if needed. Fig. 1.



SEVEN-BUOY MOORING at Barbers Point. Arrangement permits tankers ranging from 17,000-ton T-2's to future 100,000-ton ships to use terminal. Fig. 2.

Location problems. From the marine standpoint, a sea terminal in the Pacific Ocean off Barbers Point presented a number of problems. First was the problem of the ocean bottom. It is smooth, solid coral. Dropped anchors dragging on the bottom would barely check the vessel's momentum from the weight of anchor and chain; they could not be relied upon for help in maneuvering a ship into the moorings or to hold it in place.

The "heading" to be selected also gave concern. Prevailing trade winds blow from shore, while the relatively small currents parallel the shoreline. Because of difficulty in getting into the moorings, it would not be feasible to use a heading with the vessel pointing out to sea.

Finally, there was a submarine

From "Offshore Tanker Moorings," by Robert P. Howell, Standard Oil Co. of California, 1961 API Pipeline Conference, St. Louis.

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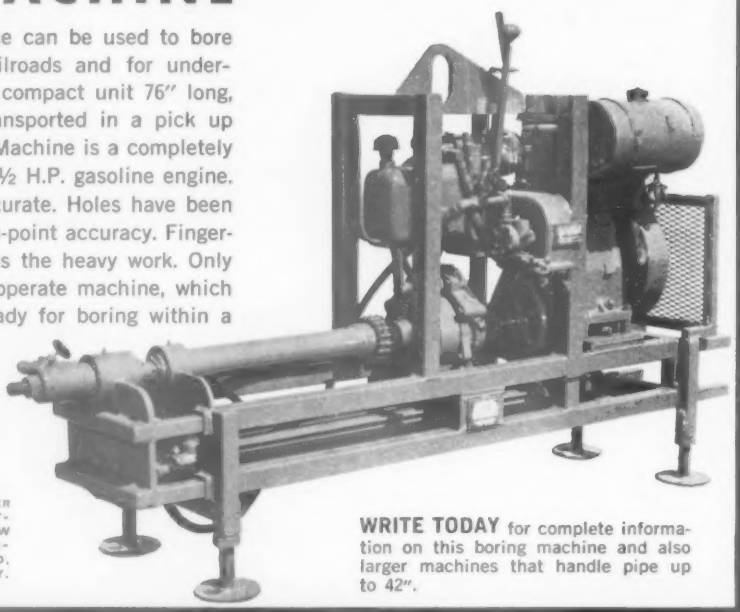

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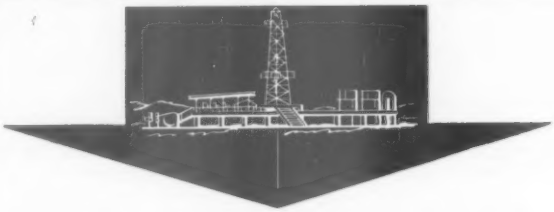

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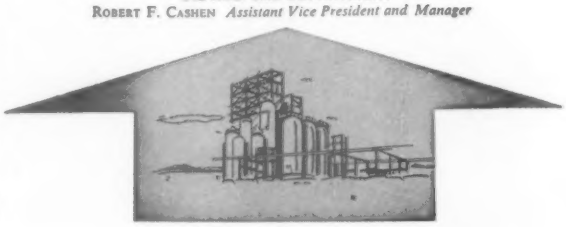
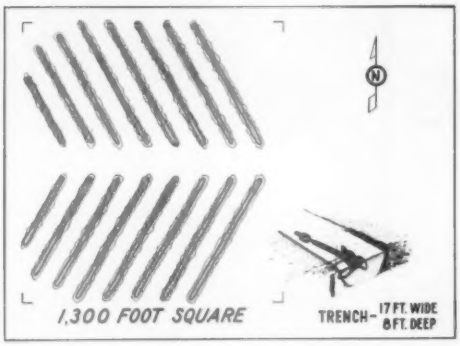




CHEVRON PATTERN was followed in blasting 17-ft.-wide 8-ft.-deep trenches in smooth coral bottom so tanker anchors would hold. Fig. 3.

pipeline problem. The underwater portion would be over 2 miles long and would go through the surf at an angle across a rocky shoreline.

Alternatives. Although we suspected that a conventional sea terminal was the right solution, we also looked at other possibilities. All had shortcomings.

This elimination of alternatives left us back where we started—determining how to use a conventional submarine line sea terminal at Barbers Point.

A major problem was to "rough-up" the bottom so that it would hold ships' anchors. To do this, both giant rooters and explosives were considered. Explosives seemed most practical. Pilot tests showed that explosive charges laid on the ocean bottom would break up the coral. With this information, we were ready to proceed with final designs.

Seventy-foot depth. The location of the terminal is shown in Fig. 1. The water is 70 ft. deep, adequate for the largest tankers and for emergency maneuvering between moorings and shallow water inshore. The heading of the ship in the moorings was parallel to shore. This permits tankers to take the most common trade winds on the port-bow quarter when in the berth. It is also an acceptable position for the ship if she must leave the moorings in an emergency.

A seven-buoy mooring was used, as shown in Fig. 2. The arrangement of the buoys had to be such that tankers ranging in size from T-2's (17,000 dw. tons) to future 100,000-ton giants could use the terminal.

The most spectacular part of the job was to prepare the bottom in the anchorage area. After considering several "designs," it was decided that large trenches blasted in a chevron pattern (Fig. 3) offered the best chance of success.

The trenches had to be wide enough so that flukes of the very largest anchors would not slide across without taking hold. The trenches also had to be deep enough to let the anchors engage solid coral, with little chance of breaking off a "skin" of surface coral. The direction of the trenches was approximately at right angles to the anchor chains of ships in the moorings.

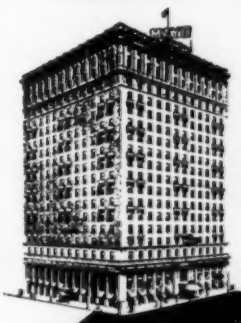
Craters formed. The first step in the trenching operation was to place "cratering" charges on 15-ft. centers. These charges were 50-lb. shots of 60% blasting gelatin. Two strings of cratering charges, each 650 ft. long, were fired together. They produced craters approximately 6 ft. in diameter filled with pulverized coral. These initial craters were cleaned out with air lifts.

Expansion charges of "Nitramon" were then placed in the clean craters and exploded. The result was a series of "trenches" made up of overlapping craters 15 ft. or more in diameter. Rubble formed in the craters was left in place.

As soon as a full trench had been excavated, California Shipping Co. brought in a tanker for an anchoring test. Its anchor held firmly in the "trench," the solution was proved, and bottom preparation was carried to completion.

A total of nearly 230,000 lbs. of explosives was used in blasting the chevron pattern. Most of the explosive was Nitramon used in expanding the initial craters. Considerable quantities of 60% blasting gelatin were used as expansion charges in areas of especially hard coral, in addition to being used for initial craters.

THE HOTEL
in the Oil Capital of the World



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Use a SWECO Iron Sponge Sweetener. Low initial cost. No moving parts, low maintenance—3 or 4 times per **year.** For H_2S concentrations up to 50 grains per hundred cubic feet. Pressures to 1,000 lbs. Capacities to 30 million.
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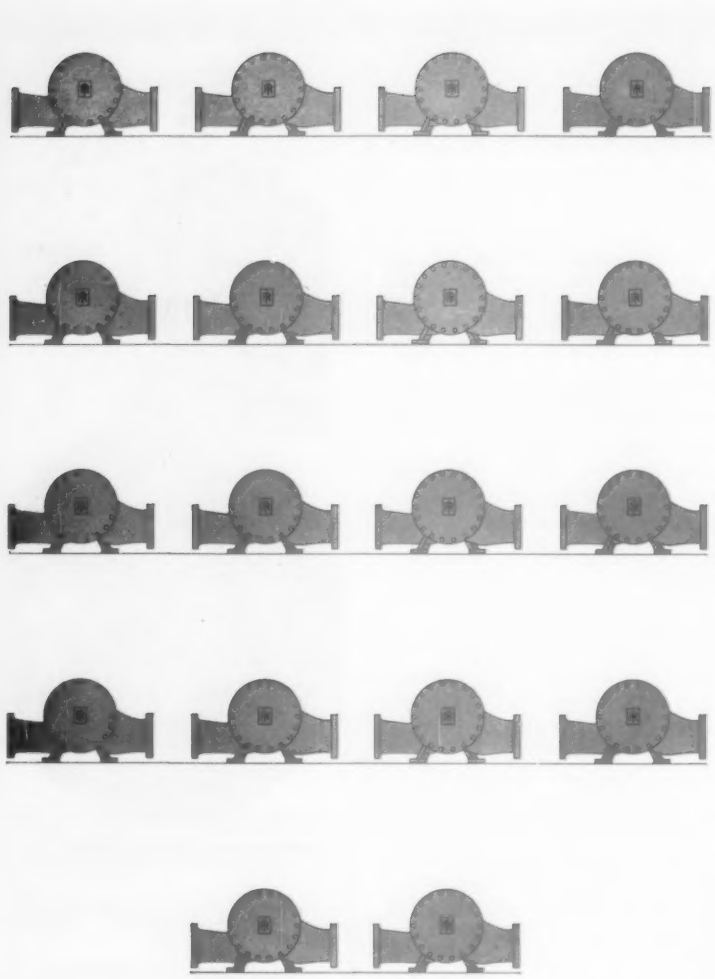
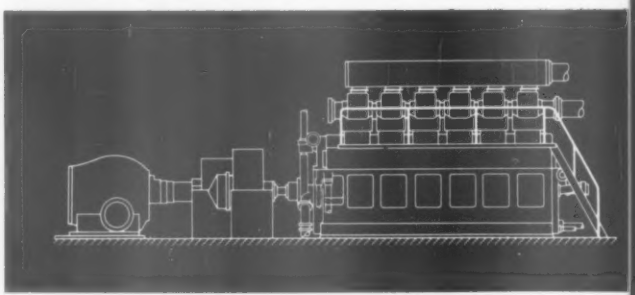
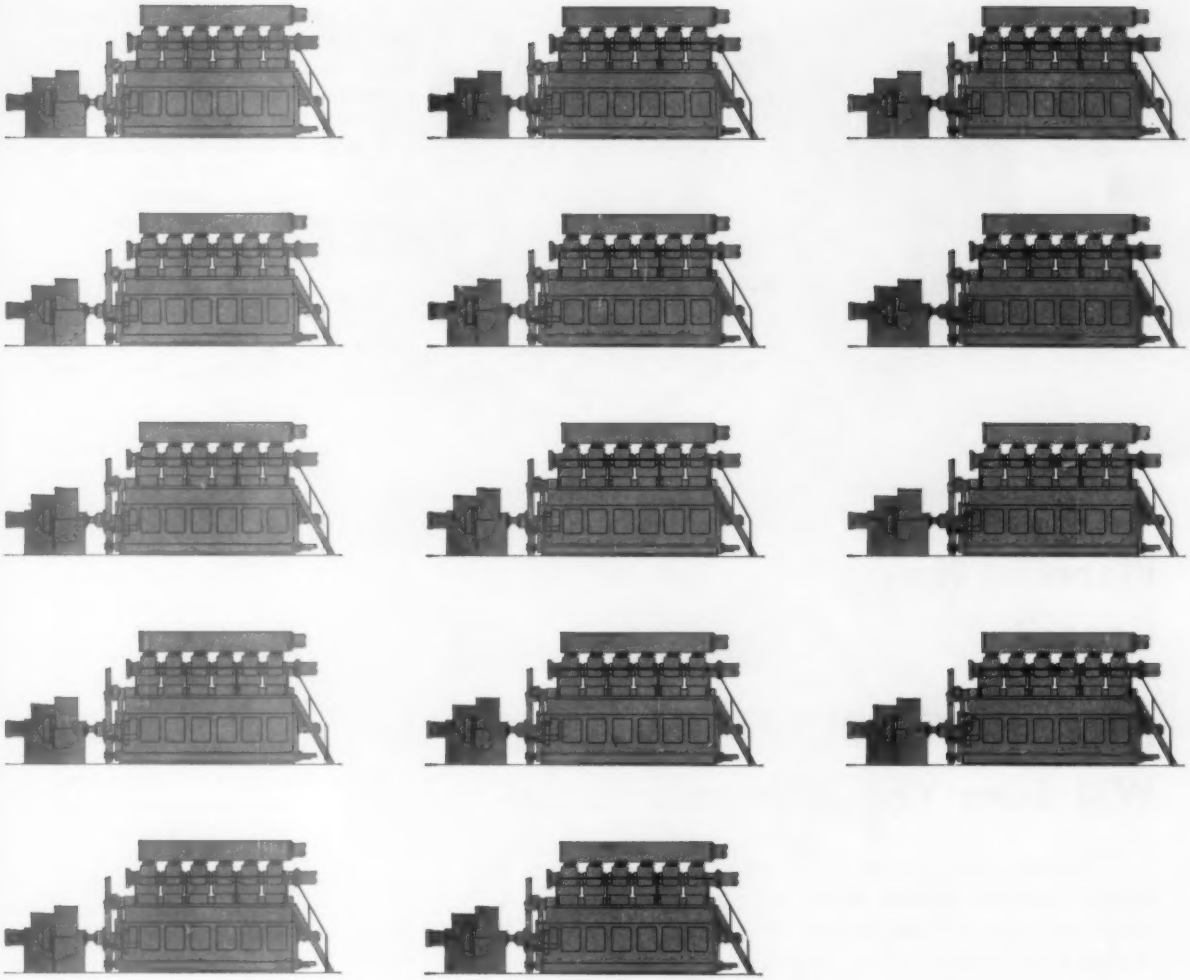


THIS MANY Ingersoll-Rand CDP centrifugal compressors

will give 495,000,000 cfd through new PEMEX 490-mile

Each centrifugal pipeline compressor will be driven by a 12-cylinder, 3300-hp PKVT gas engine — precision-matched for top performance and economy. The units are arranged in series, and each will handle the full throughput.





and *THIS MANY* Ingersoll-Rand PKVT gas engines

of gas a 59,400-hp push Tabasco-Mexico City pipeline.

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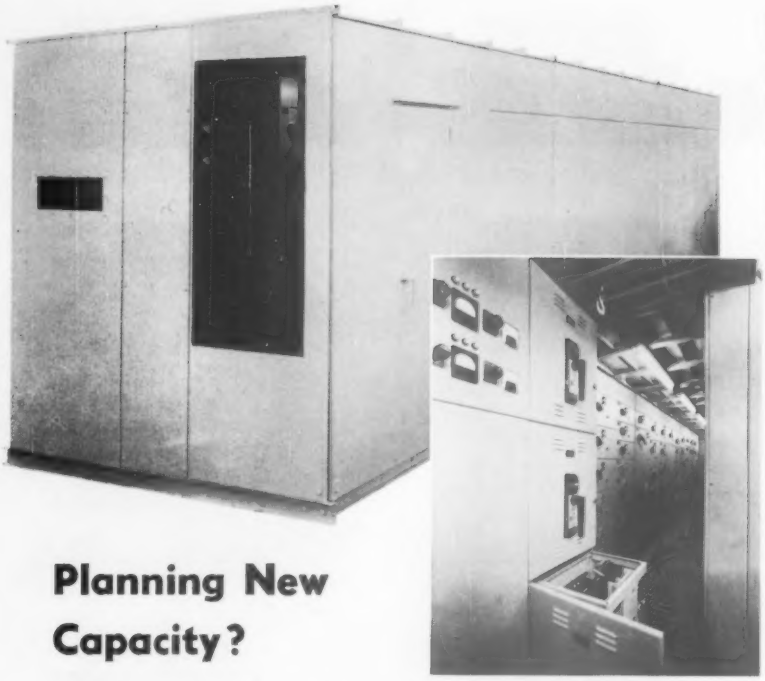


Planning New Capacity?

NELSON'S "*POWER HOUSE*" Will Save You Time and Money

Imagine the economies and advantages of having a factory assembled, factory wired unit containing a variety of equipment such as low voltage switchgear, motor control centers, high voltage starters, metering and relay equipment, etc., in a single weatherproof structure giving complete protection against rain, snow and sleet. The Nelson "Power House" can be pressurized for use in hazardous areas.

Each unit is designed to fit your requirements. If you are planning either new construction or a plant expansion program, contact your Nelson representative or write for Bulletin 1035D.

- **Reduces installation cost.**
- **Eliminates costly construction yet provides shelter for operators and maintenance people.**
- **Complete package — nothing extra to buy.**
- **All components factory wired — factory tested.**

BIG ENOUGH TO PERFORM SMALL ENOUGH TO CARE

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

P. O. BOX 5385 NATIONAL 7-5530

Two permanent bow buoys were provided at the edge of the prepared anchorage area (Fig. 2). As a further safeguard to vessels in the moorings, lines can be run over the bow to these buoys in moderate or heavy weather when it would be unwise to depend absolutely on the holding power of ship's anchors in the coral trenches.

Submarine lines. After considering various operating methods and studying the economics of several systems, the following lines were selected:

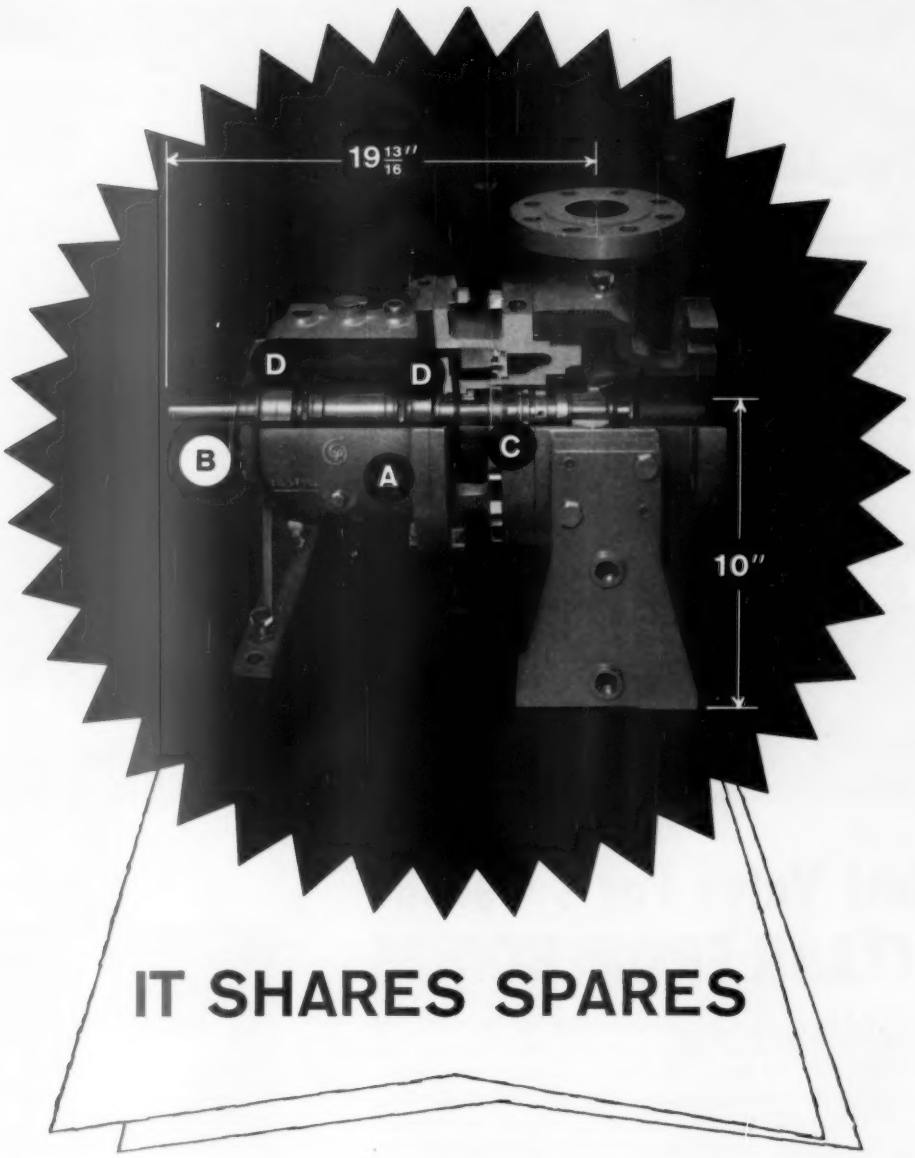
Crude line: 30-in. submarine pipeline with a 6-in. internal heating line. Hot water in the internal line will be used for heating if a waxy crude should be left in the line in an emergency, or if heating is needed for some other purpose. The hot water for heating will be wasted to the sea. The internal line is also provided with a submarine hose and can be used for light products or clean refinery stocks.

Bunker line: 20-in. submarine line with 4-in. internal heating line. For this system, hot water in the heating line will be used to preheat bunker fuel in the system and permit bunkering to start. Additional heat will not be required during normal bunkering operations. The hot water will be wasted to the sea.

A feature of both systems is the careful attention given to design and fabrication of the internal heating lines. After installation, both internal lines were pretensioned cold to 17,000 psi. to insure that they will remain in at least slight tension under usual operating conditions. With this pretensioning, the heating lines will have no tendency to expand—and perhaps buckle—as they might if neither stressed nor effectively guided.

For protection and weighting, both lines are Somastic-coated and covered with a concrete jacket. The lines are also under cathodic protection.

No ballast-disposal facilities are provided. Most vessels using the terminal are large tankers coming in loaded. They take on salt-water ballast for their return voyages. Other small vessels running to the Pacific Coast refineries will arrive with small amounts of ballast that will be kept on board.



IT SHARES SPARES

Cut parts inventory with this high-temperature process pump

You can stay covered for any emergency with a small stock of parts when Goulds Model 3775 pumps your hot —or cold—liquids. That's because all 12 pump sizes are built on one bearing frame **(A)**. One shaft **(B)**, one seal **(C)**, and one bearing set **(D)** for every pump. One coupling fit, too.

Save Process Design Time. Constant dimensions make it easier for you to design your process. Length of shaft and height from base to suction centerline are the same for all 12 sizes.

Back Pull-Out Makes Upkeep Easy. Seal replacement and maintenance are simple. A millwright alone can remove the rotating parts without disturbing the pipe connections or driver.

Cooled Seal. Hot pumpage never touches the mechanical seal. Seal is isolated in its chamber, surrounded by cool, dead-ended liquid. Coolant circulates through jacket, keeps seal face down to 250°F. *even when pumpage reaches 750°F.*

Cooled Bearings. Bearings last longer because water-cooled housings keep their temperature constant.

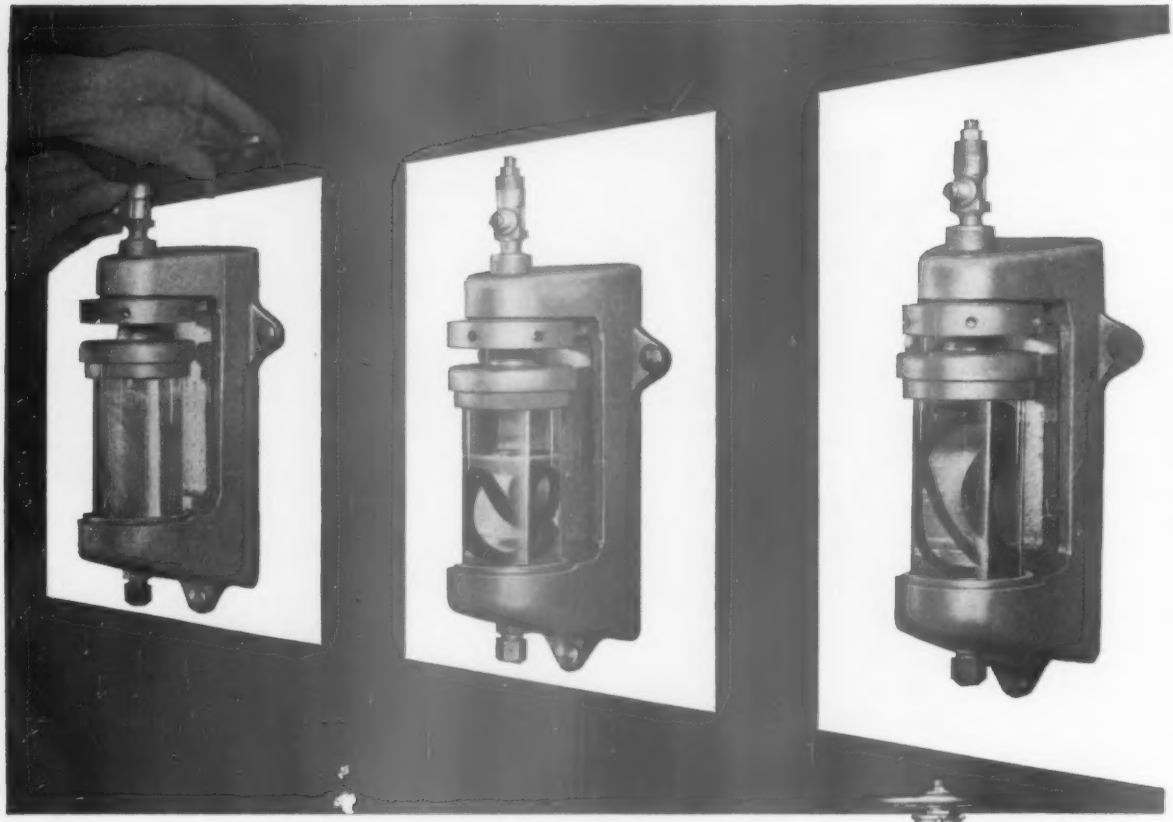
Versatile. An economical solution for cold as well as hot services, this single design covers an extremely wide range of applications. It handles temperatures from −350° to +750°F.

The Model 3775 is built to API specs, handles pressures to 600 psi, capacities to 1200 gpm and heads to 500 feet.

For a more complete story on how Model 3775 can help you cut pumping costs, write for Bulletin 724.1. It contains a parts interchangeability chart, dimensions, pressure-temperature chart and other helpful information.

Goulds Pumps, Inc., Dept.OGJ-61, Seneca Falls, N. Y.

GOULDS PUMPS



Kerotest Valve Parts Get the ALL CLEAR FROM BOMBS

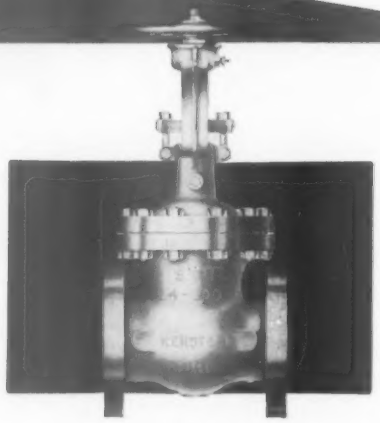
All materials and parts that go into Kerotest Valves must first get the all clear in these pressurized material test bombs at the Kerotest laboratories. Packings, plastics, gaskets, O-rings, seat rings, steel, and other materials are accepted as suitable only after they've withstood the deteriorating effects of various gases, vapors, liquids and refrigerants for specified test periods.

Kerotest quality controls are applied from the initial development and engineering phase to the final assembled valve. For those who specify and use Kerotest Valves these high standards of material and production quality mean greater valve value per dollar. With Kerotest there's minimum risk of valve failure in service and improved operating efficiency with less maintenance.

Kerotest Cast Steel Gate Valves

High quality Kerotest cast steel gate valves are available in primary service pressure ratings ranging from Series 150 to Series 1500. They are supplied in various combinations of body and trim material for all types of service in oil, gas, steam, water, chemical, petro-chemical, marine and industrial installations.

Send for your free copy of the new, informative Kerotest booklet. It's packed with working tables, dimensions, specifications and other helpful information.



KEROTEST
Quality Controlled Features

- Reinforced wall sections guard against unusual strains — erosion and corrosion.
- Built for repacking under pressure in the full open position.
- Deep stuffing box for greater packing life and tighter seal.
- Threaded, bottom seating type seat rings. Made without protruding lugs to permit full clear way opening through valves.
- All yokes made to withstand rough handling and equipped with lubrication fitting to stem nut.

There is a Kerotest Cast Steel Valve available for every class and condition of service.

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In Canada... Kerotest Cast Steel Valves are manufactured and distributed exclusively by Guelph Engineering Company, Guelph, Ontario, Canada

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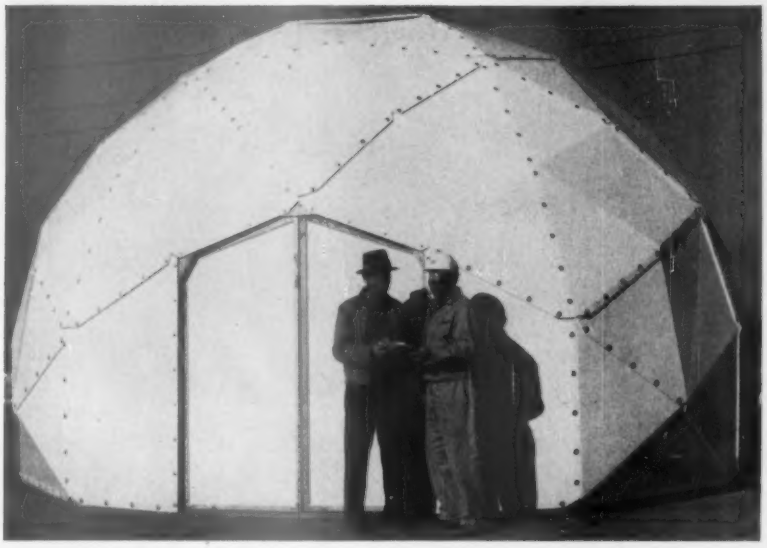
What's NEW . . . in equipment



Portable structure can serve as temporary office or tool shed

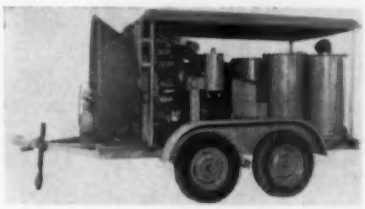
THREE HUNDRED AND FIFTY-TWO square feet of usable floor space for field use are offered by a lightweight, dome-shaped structure measuring 22 ft. in diameter recently developed. The maker claims the structure, called a Geospace, is more durable and costs less than a tent of equal size.

The dome is 12½ ft. high and weighs only 450 lb. It is formed from prefabricated triangular panels of ½-in. thick Fomecor board, resin-coated for weather resistance. These are bent and bolted together at the site in a geodesic design. The Fomecor board is a "sandwich" of rigid foamed plastic bonded between sheets of heavy, water-resistant kraft paper. A 6-ft. triangular panel of the dome weighs only 3 lb. The maker further claims that two men without experience can assemble the dome in 1 day using conventional hand tools.

The shelter comes equipped with a hinged double door, window openings, and ceiling vents in several colors. No foundation or special site preparation is needed. The unit bolts to a wooden base ring which is staked to the ground. When the dome is unstaked, four men can lift and move it. Source: **Filtered Rosin Products Co.,** 800 N. Lindbergh Blvd., St. Louis 66, Mo., U.S.A.

Inert gas for job-site purging

PURGING AND BLANKETING OPERATIONS can be carried on effectively in refineries and petrochemical plants with the aid of a portable inert-gas generator now being manufactured and rented. The machine can be set up to produce inert gas at the job site where it is needed.



The inert gas is a mixture of nitrogen, carbon dioxide, and argon. When free of oxygen, carbon monoxide, hydrogen, and other impurities, the inert gas is nonexplosive and can be used to purge explosive gases and toxic fumes from compartments and tanks to prevent evaporation of volatile liquids.

Trailer-mounted, the generator is capable of producing up to 1 M.M.c.f.d. of inert gas, the maker says. Source: **Inert Gas, Inc.,** 5405 Clinton Dr., Houston, Tex., U.S.A.

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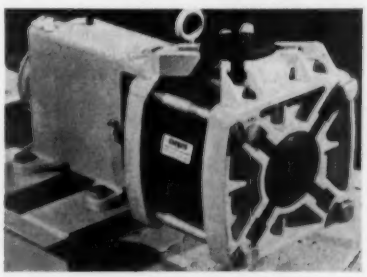

Impervious graphite pump now made in a smaller size

The maker of a line of frame-mounted pumps of impervious graphite now offers the pumps, previously available with discharge openings from 2 to 4 in., in sizes with discharge openings from 1 to 2 in. The new Type F pumps have an internal rotary seal arrangement. Source: **National Carbon Co.,** 270 Park Ave., New York 17, N. Y., U.S.A.

Need more facts on the items described on these pages?

The manufacturers will gladly supply them. They're shown in bold type, with their addresses. For convenience, send this coupon to the manufacturer.

ITEM _____

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OIL AND GAS JOURNAL
June 19, 1961

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TEX-STEAMERS available in 10, 20, 40, 65, 125 HP models from 75 to 600 lbs. pressure. 325 to 3450 lbs. steam per hour from and at 212 F. Write for catalogue with complete details.

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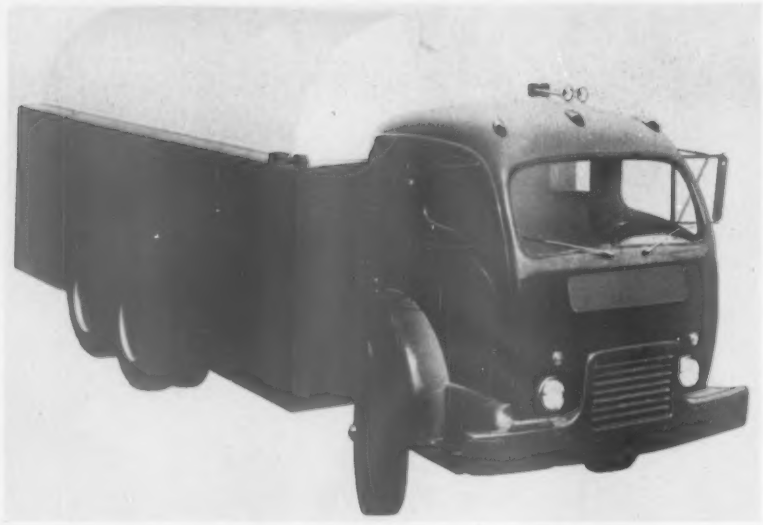
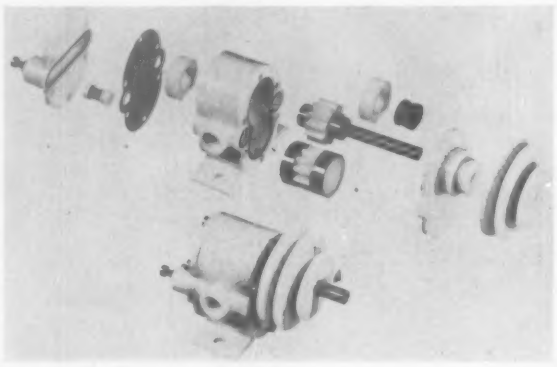


Liquid nitrogen for well tests

A LIQUEFIED-NITROGEN mobile unit for oil-well completion and testing has been developed. The unit is truck-mounted and gives pressures up to 15,000 psi. It has a capacity to transport 186 M.c.f. of nitrogen.

All of the liquid nitrogen can be converted at the desired delivery pressure into gas. The nitrogen can be used as a displacement medium for well completion and as a carrying medium for inhibitors, surfactants, and paraffins. Too, it can be used for cementing, aerification of drilling mud, testing blowout preventors, fracturing and acidizing, and for perforating.

The nitrogen unit includes a 2,000-gal. cryogenic-storage tank, high-pressure pump, and a gasoline-fueled vaporizer. The nitrogen is pumped to desired pressure and then vaporized and heated to the desired delivery temperature with the vaporizer. The complete unit mounts on a three-axle truck. Source: **Cosmodyne Corp.,** 12833 Simms Ave., Hawthorne, Calif., U.S.A.



Gear pump made of plastic

HIGH CORROSION RESISTANCE is offered by a new gear type of pump designed in thermoplastic material. It is expected to prove particularly valuable in such corrosive applications as salt-water disposal and pumping of crude oil containing a high salt-water content. All major parts are made of Delrin acetal resin. This resin is a rigid, high-strength material with mechanical properties approaching those of nonferrous metals.

The manufacturer reports that

There's a Gates Hose for every job ...quick delivery from local stocks

Wherever hose is used in the oil fields, you find Gates Hose giving outstanding service. Gates makes a hose for every job: rotary and vibrator hose, API Class C with Barney couplings; swivel hose and hydraulic hose, both SAE 100R1 and 100R2; mud pump hose that is virtually collapse-proof; acidizing hose, air hose, water hose, etc.—every type top-quality and in a full range of sizes.

You get fast delivery day or night from local sources.

Oil field supply houses with stocks of Gates Hose are located near you, backed by Gates Service Centers in every major oil-producing area. Your supply house representative is closely backed by a local Gates Fieldman—a factory-trained hose expert. *For quick delivery, day or night, of Gates Hose of any kind, call your nearby Gates-stocked supply house.*

The Gates Rubber Company, Denver, Colorado BP42

Gates Powercord High-Pressure Rotary and Vibrator Hose

- API Class C, 5000 psi test pressure
- Barney coupling is permanently bonded to hose
- Easy to handle, install and relocate —internally balanced to coil easily and to resist twisting under pressure
- Meets the demands of high working pressures and great depths

A Gates Hose for any need is quickly available from your nearby supply house:

Building the future on 50 years of progress

Gates®

Gates Oil Field Hose

tests indicate the plastic design of the pump reduces horsepower requirements by as much as 50% compared to metal models. The pump comes in capacities from 69 to 635 bbl. a day for pressures from zero to 100 psi. with nonlubricating liquids.

You can operate the pump forward or reverse with or without a pulley drive and with or without an internal bypass. A ball-bearing unit in the drive sheave is supported by the housing through the external hub on the front plate. The gears have integral hubs over which a thin metal sleeve is pressed. Source: **Planet Products Corp.**, 221 North La Salle, Suite 1363, Chicago 1, Ill., U.S.A.

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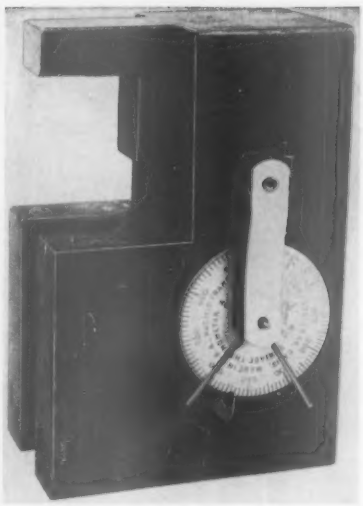
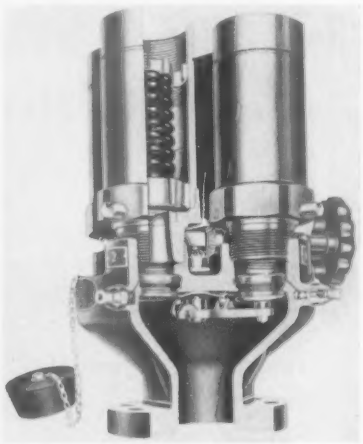
Surface temperatures measured

In 1 minute, a new spot surface thermometer reaches stability and gives the surface temperature of superheated-steam and other pipes and boilers. Made of stainless steel,



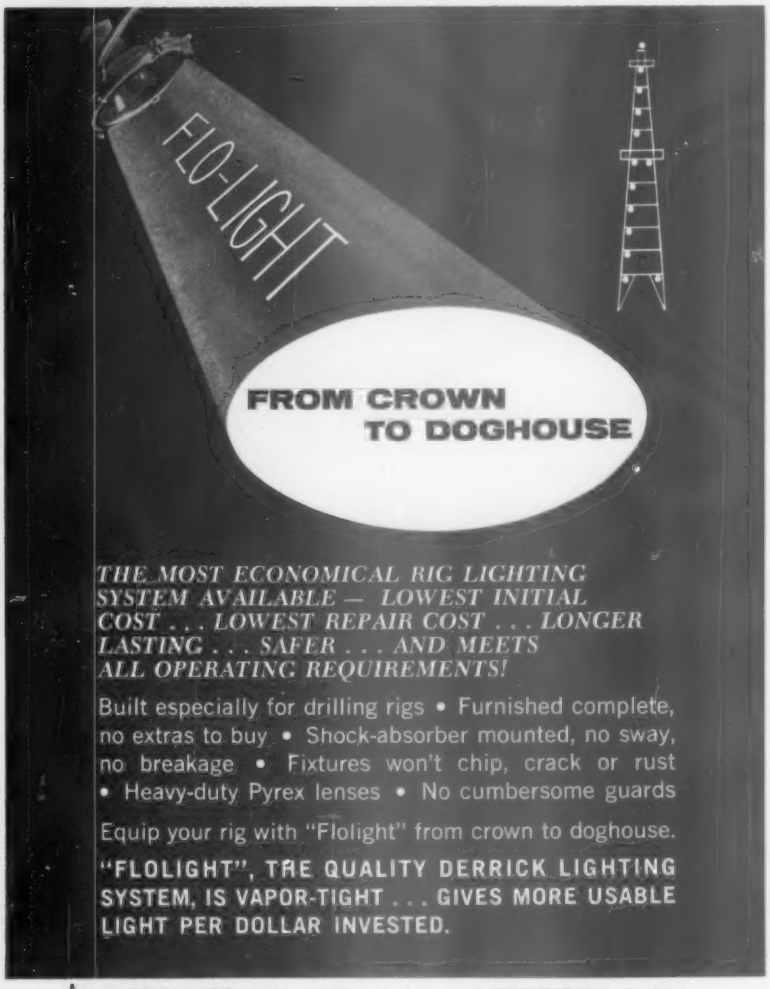
the thermometer has a temperature range from 0° to 540° C.

Available for the thermometer is an alnico magnetic clip that makes possible the use of the thermometer on nonhorizontal ferrous surfaces. Also available is a set of pointers which record the minimum and maximum temperatures attained during the measuring period. The thermometer has an over-all diameter of 1¾ in. and weighs ⅓ oz. Source: **Pacific Transducer Corp.**, 11836 W. Pico Blvd., Los Angeles 64, Calif., U.S.A.



Safety-relief valve manifolds

Dual relief valve systems aren't needed with a line of safety-relief-valve manifolds now obtainable, the maker reports. The Series 8500 safety-relief-valve manifolds come with 2 to 4 valves in threaded mounts. They're designed to give continuous, uninterrupted service on pressurized storage tanks containing


FLO-LIGHT
FROM CROWN TO DOGHOUSE
THE MOST ECONOMICAL RIG LIGHTING SYSTEM AVAILABLE — LOWEST INITIAL COST . . . LOWEST REPAIR COST . . . LONGER LASTING . . . SAFER . . . AND MEETS ALL OPERATING REQUIREMENTS!
Built especially for drilling rigs • Furnished complete, no extras to buy • Shock-absorber mounted, no sway, no breakage • Fixtures won't chip, crack or rust • Heavy-duty Pyrex lenses • No cumbersome guards
Equip your rig with "Flolight" from crown to doghouse.
"FLOLIGHT", THE QUALITY DERRICK LIGHTING SYSTEM, IS VAPOR-TIGHT . . . GIVES MORE USABLE LIGHT PER DOLLAR INVESTED.

"FLOLIGHT" Derrick Lighting Systems and "RUMBA" Shale Shakers with De-Sander are sold through supply stores everywhere.

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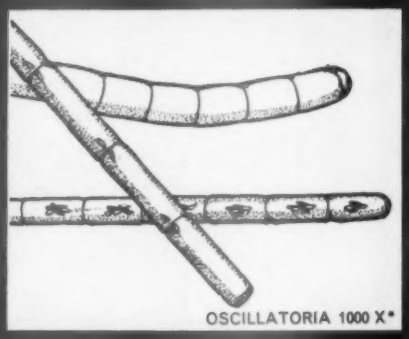
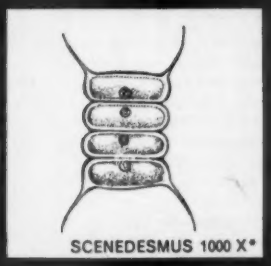
P. O. BOX 9335 • HOUSTON 11, TEXAS
A SUBSIDIARY OF REVERE ELECTRIC MANUFACTURING CO.

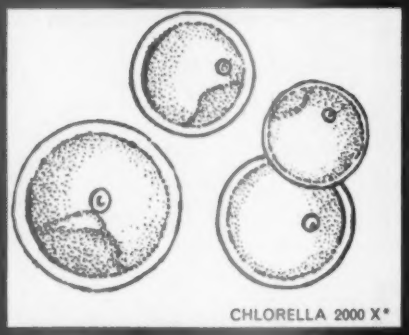
Here's what grows in your cooling towers

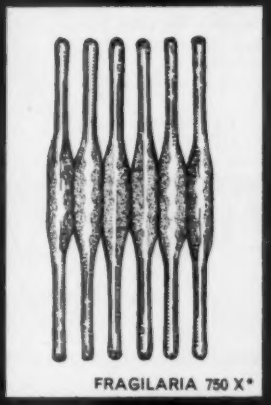

OSCILLATORIA 1000 X*

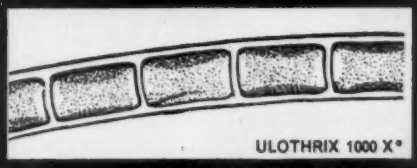

SCENEDESMUS 1000 X*

MELOSIRA 1000 X*

LEPOCINCLIS 500 X*


CHLORELLA 2000 X*


FRAGILARIA 750 X*


ULOTHRIX 1000 X*

*MAGNIFICATIONS AS SHOWN

Dearcide® kills them!

An ideal environment exists in open, recirculating cooling systems for the growth of algae and other microbiological organisms of many types. These often reduce efficiency of cooling towers, heat exchangers, and circulating systems . . . can lead to serious corrosion of cooling system components and deterioration of cooling tower wood. ■ Chlorine in various forms or combinations has, in the past, been a major combative agent in general use in spite of certain objectionable characteristics. ■ Now, Dearcides—products of Dearborn research laboratories—provide more effective control without introducing problems of corrosion, toxicity, and high maintenance costs. Dearcides are non-corrosive . . . will not attack cooling system components . . . have no deleterious effect on wooden cooling towers . . . are compatible with commonly used water treatment chemicals . . . require no feeding equipment. Most have extremely low toxicity to fish and animal life . . . may be used when cooling tower blow-down water is discharged directly into streams or lakes.

MAIL THIS COUPON TODAY

SEND FOR THE REPORT of a two-year study of algae in cooling towers in all parts of the country, made by Dearborn Microbiologist Edward Tehle, Jr. It contains technical information pertinent to your plant wherever it may be located. It's free. It's interesting. It's a valuable reference piece for your water treatment library. Send for it today.

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CALL THOMPSON PUMP CO. SALES and SERVICE Stores for "full-line" service on Thompson rod pumps. Thompson oil well pumps are made to run longer with expert Thompson care. Our service stores and supply stores carry a complete parts stock, pickup and deliver, or make emergency field repairs. Special tools protect tubes and parts being repaired. Call the Sales and Service Store near you:
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More equipment manufacturers choose Fast's Couplings than any other gear-type coupling
COUPLING A BILLION HORSEPOWER
Leaving other claims aside, the thing that counts in couplings is customer confidence—and industrial equipment manufacturers have made Fast's their overwhelming choice. The Fast's line is more diversified, too—in a complete range of sizes and types for shafts, from ½" to 32" and larger.
Every Fast's Coupling brings you superb engineering only the original gear-type coupling can deliver. Smooth-running units that are designed to outlast the machines they connect. Rapid service from experienced field engineers backed by outstanding stock facilities. Write today for full details on couplings to suit your needs to: KOPPERS COMPANY, INC., Fast's Coupling Dept., 1406 Scott St., Baltimore 3, Maryland.
KOPPERS
FAST'S COUPLINGS
Engineered Products Sold with Service

LPG, butadiene, and certain other hydrocarbons.

Directly connected to the flanged tank opening, the manifolds require no inlet piping or shutoff valves. While a storage container is under pressure, any one of the valves can be removed for service without the discharge of product. This is accomplished by a handwheel that forms a part of the manifold. It selectively closes off the entrance port to the particular valve you wish to remove.

The valves open only slightly to relieve moderately excessive pressures. But they open to full discharge capacity when tank pressures increase above 120% of set pressure. After discharging, they seat automatically. The manifolds are available for set pressures from 40 to 300 psig. Source: **Bastian-Blessing Co.**, 4201 W. Peterson Ave., Chicago 46, Ill., U.S.A.

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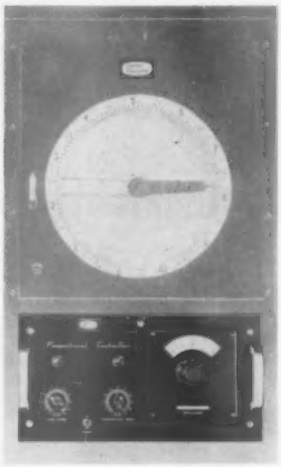


Controller to cut cycling

Proportional on-off process control with almost imperceptible cycling can be obtained with a new electronic proportional controller, the maker claims, and it won't permit process conditions to exceed preset limits. It can be used with such primary instruments as indicators or indicating recorders having transmitting slide wires to accurately control temperature, pressure, pH, chemical concentration, or liquid level.

Press-condition information received from a primary instrument is converted by the controller to an operating signal. Preselected time

BETTER COATINGS THROUGH RESEARCH

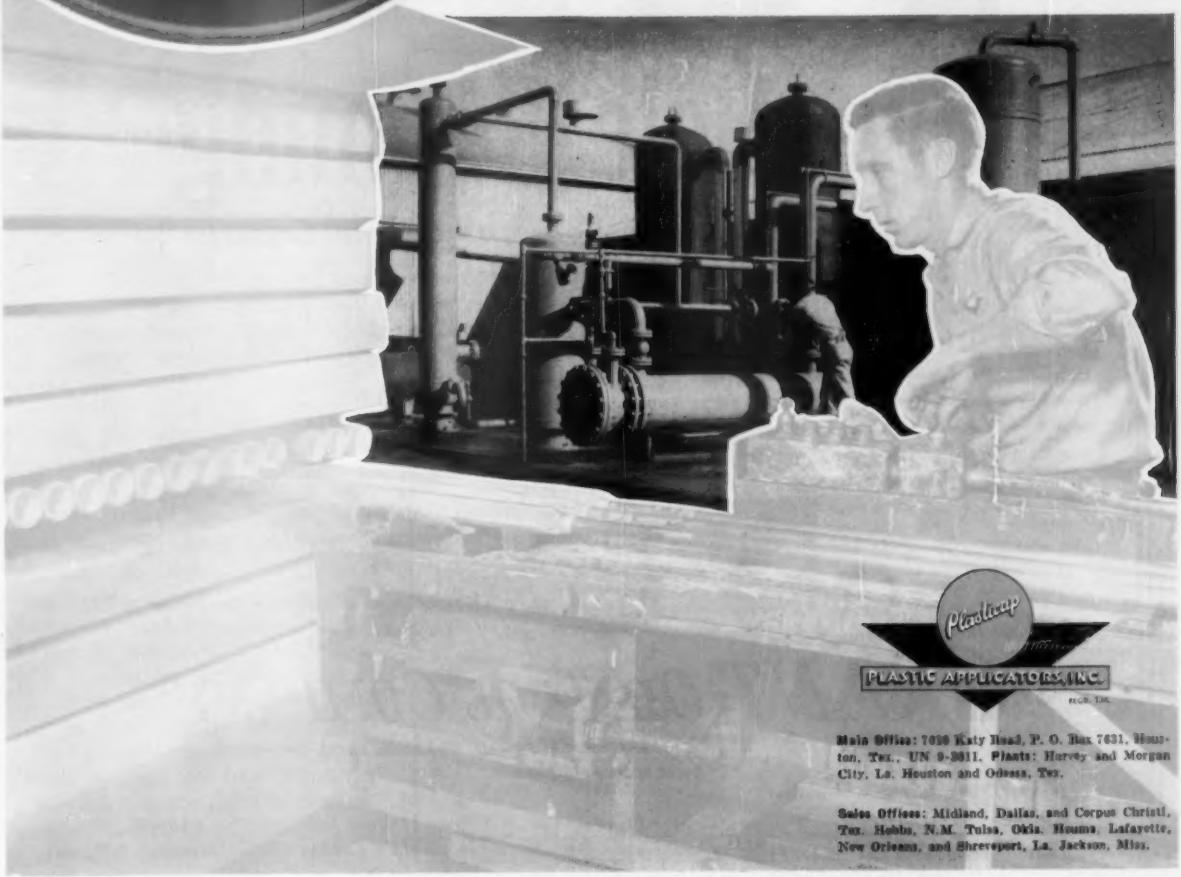
RESEARCH EFFORT: ***To provide ever-improved plastic coatings to our customers by developing even better methods of insuring maximum quality and purity of Plasticap coatings applied to tubular goods.***

RESULT: ***Air dehydrators have been installed at all Plastic Applicators plants to remove water, oil, and other impurities from air used in applying Plasticap coatings.***

• Furnishing the best possible plastic coatings to the oil industry is the number-one task at Plastic Applicators. Therefore a continuous high-priority research program is conducted in our own laboratories and in those of independent research organizations under contract to Plastic Applicators.

• Among the many advances that have come from this sustained research program was confirmation of the fact that conventional air-cleaning equipment does not completely remove airborne water and oil. Remaining water and oil can form emulsions that are harmful to plastic coatings. To eliminate this possibility, Plastic Applicators has installed air dehydrators at each of its plants to remove all water, oil, and other impurities from air used in applying Plasticap coatings.

PROTECT YOURSELF AND YOUR PIPE. SPECIFY PLASTICAP. MORE TUBULAR GOODS ARE PROTECTED WITH PLASTICAP THAN ANY OTHER COATING.



Plasticap

PLASTIC APPLICATORS, INC.

Main Office: 7050 Katy Road, P. O. Box 7631, Houston, Tex., UN 9-3011. Plants: Harvey and Morgan City, La. Houston and Odessa, Tex.

Sales Offices: Midland, Dallas, and Corpus Christi, Tex. Hobbs, N.M. Tulsa, Okla. Houma, Lafayette, New Orleans, and Shreveport, La. Jackson, Miss.

Down Hole Reaming

You can get from Grant!

This is just one of the three *families* of Grant Tools made for reaming, hole enlarging and stabilizing. For full information on these, and a wide range of other down-hole and surface tools made by Grant, send for your copy of the complete Grant Catalog today, or see the Grant section of Composite Catalog!

When you order out your next Reamer—*call Grant*. Different well conditions, different formation, depth and drilling requirements, and even different preferences have resulted in *three* distinct Grant Reamer types to meet *every* need. Then add

Six cutter types for every formation
Three, six or *nine* point body styles
Size ranges for *all* hole diameters

and you have an unlimited selection of Grant Reamers for reaming any well you drill . . . stocked and serviced by Grant in active areas *everywhere*.

It pays to ream *right*. And to use the *right* reamer, call Grant—*because only Grant makes them all!*

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and rate functions are superimposed and the modulated signal amplified by a high-gain relay type of amplifier to actuate a control relay connected to the process under control. Source: **Thermo Electric Co., Inc.,** Saddle Brook, N. J., U.S.A.

●

Product to loosen frozen fittings

An extending spout on the container housing a new penetrant lets you put the rust-freeing liquid on the desired spot. The product, called Rust Buster, comes in a plastic squeeze bottle, and according to the maker, contains no acid, alkali, or other harmful ingredients. It is claimed to quickly loosen rusted bolts, screws, shafts, piping, and other connections and assemblies. Source: **Armite Laboratories,** 67th & Broad, Los Angeles 1, Calif., U.S.A.

●

Vinyl liners for chemical vessels

Old chemical-storage vessels can be restored to usefulness with a new tank liner made of heavy vinyl sheeting. The liners, available custom-fabricated, are resistant to a variety of acid, alkaline, and salt solutions, and some hydrocarbons.

According to the manufacturer, the liners are easily installed by the regular plant maintenance crew. Little preparation of the tanks is required because the vinyl liners are not bonded to the surface. Source: **Comar Plastics Co.,** Edison, N. J., U.S.A.

MACCO

MACCO CASING PRESSURE OPERATED GAS LIFT VALVES

Conventional Outside Mounted CM2 Intermitting or Continuous Flow Valve

INTERMITTING . . . This type valve is normally used in wells with producing capacities up to approximately 350 barrels per day. Fluid is lifted intermittently as "slugs" in relation to the producing capacity of well. A large volume chamber in the stem makes the valve "snap acting," thereby operating at peak efficiency. Frequency of intermitting cycles is controlled by a surface intermitter or casing choke.

CONTINUOUS FLOW . . . For wells in the continuous flow range, this type valve is equipped with various scientifically designed port sizes to meet the requirements of the individual gas lift installation. In most installations, the only surface equipment required is a choke in the casing input gas line.

Macco pressure operated intermitting and continuous flow valves are available in CM2 (1½" O.D.) for standard installations and CM1 (1" O.D.) for "slim hole," parallel string or concentric string installations.

For further information write for Brochure Nos. 2-12A, 2-12B and 6-12.

MACCO OIL TOOL COMPANY, INC.

1521 Prince P. O. Box 7288 Houston 8, Texas
Phone UN 1-1253

Don't take chances on couplings

CHECK PUBLISHED MISALIGNMENT RATINGS BEFORE YOU BUY

Since misalignment is the basic problem that shaft couplings are designed to solve you'll find a published conservative misalignment rating (along with load capacity rating) for every Fast's Coupling. Compare it with the misalignment rating of any other coupling you are considering.

One further advantage of Fast's Couplings' misalignment ratings: You save money on installation because, knowing the ratings, you don't have to line up driving and driven elements with pinpoint accuracy. It's one more important reason why Fast's Couplings are the choice of more equipment manufacturers than any other gear-type coupling. KOPPERS COMPANY, INC., 1406 Scott Street, Baltimore 3, Md.

KOPPERS

FAST'S COUPLINGS

Engineered Products Sold with Service

BONDSTRAND®
THE "PROBLEM-SOLVER" PIPE

Bondstrand is no ordinary plastic pipe: Made of tension-wound glass filaments, impregnated with chemical-resistant resin—either epoxy or polyester—it is strong as steel . . . yet only one-eighth the weight.

THE PROBLEM	THE LOCATION	THE SOLUTION
Carbon black slurry destroyed schedule 40 steel pipe in 30 days	Synthetic Rubber Plant	Bondstrand installed 1959. No failure. Performance still rated excellent
Chlorine Dioxide water caused failure in stainless steel pipe	Paper Plant	Bondstrand installed 1958. Performance still rated excellent
10% Ferric Chloride solution destroyed ordinary steel or stainless	Sewage Treatment Plant	Bondstrand installed 1958. Performance still rated excellent
Salt water well injection at 1600 psi	Petroleum Production	Bondstrand installed 1958. No failure. Performance still rated excellent

Bondstrand's total installed cost can be actually competitive with ordinary carbon steel pipe. Write for bulletin containing physical and design data.

Amercoat® CORPORATION
132A

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111 Colgate Buffalo, N.Y.
2404 Dennis St. Jacksonville, Fla.
6530 Supply Row Houston, Tex.

Centrifugal pump for corrosives

Almost any service that requires a pump to handle both corrosive and noncorrosive liquids can be handled with a new cradle-mounted centrifugal pump which is being marketed in three models and in ratings from ¼ to 50 hp. Capacity ranges up to 1,000 g.p.m. and total head ranges up to 240 ft.

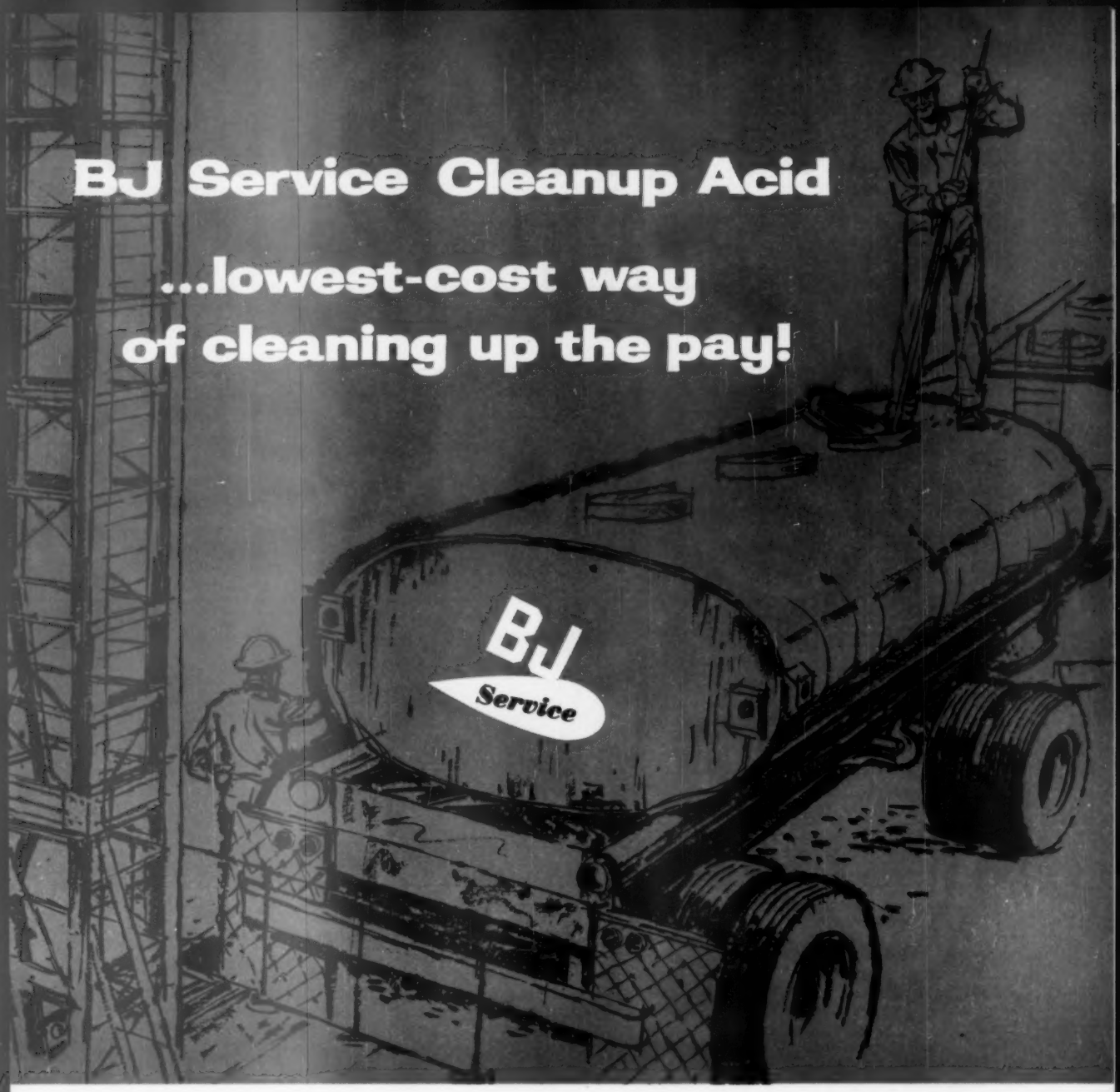
The pump casing is a vertically split design. The suction and discharge connections are flanged. Jacking bolts are provided to make it easy to remove the casing and impeller. The shaft turns on ball bearings which are mist-lubricated. A flexible coupling, gear, or belt-and-sheave system can be used to drive the pump. The seal may be a conventional packed box or mechanical seal. Source: **Ingersoll-Rand Co.,** 11 Broadway, New York 4, N. Y., U.S.A.

●

Newest monitor switch gives automatic check on measurements

A signal from a new monitor switch can be used with various timing devices to obtain an automatic check that a product is being measured and recorded. The switch is designed for use with a line of meters now on the market.

If product flow stops, the switch stops producing a signal. By using coordinated control equipment, you can cause an alarm to be sounded, valves to be opened or closed, or other devices to be activated. Source: **Ralph N. Brodie Co.,** Alvarado & W. 137th Ave., San Leandro, Calif., U.S.A.



Cleanup Acid is the lowest-cost way of removing mud filter cake... increasing well productivity. It loosens and disperses filter cake solids so they can be removed from the well... increases productivity of formations that have been invaded by drilling mud... helps break emulsions and water blocks. Ideal, too, as a spearhead to increase the effectiveness of fracturing and acidizing treatments... or to ensure a better bond in casing or squeeze-cementing operations. And BJ Service Cleanup Acid costs *far less* than dissolving-type chemical solvents. Available in 5% solutions for sandstones or other HCl-insoluble formations... or in 15% solutions for HCl-soluble formations like limestones and dolomites—and *only* from BJ Service.

For complete details, call your local BJ Service field station today.

Leadership in Chemical Services Since 1932

Another outstanding example of field-proven developments from BJ Service Laboratories is J-Type Acid. J-Type is inhibited hydrochloric acid with surfactants to lower surface and interfacial tension and prevent formation of emulsion and water blocks. Used in carbonate reservoirs, it increases productivity by enlarging flow channels and leaving them free of emulsions. It has the additional advantages of faster and more complete clean-up, which reduces swabbing time. And J-Type Acid is "tailored" to individual jobs for *best* results.

BJ SERVICE, INC.

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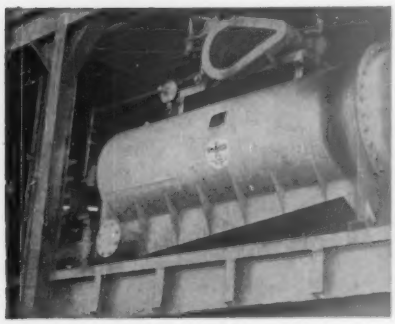
BJ B-W SERVICE

Three good ways to cut drilling costs

The three units shown here are important items behind the recent revolution in drilling fluids that has done so much to speed drilling and cut costs. Each is designed for a different problem but all are efficient and economical. Equally important, all are handled by SWACO -- the leader in mud-treating equipment.



SWACO D-GASSER®

Operators frequently report saving the entire rental cost of a D-Gasser on a well in less than a day.
When mud is gas-cut, the D-Gasser saves money in many ways. It cuts time lost for circulating after trips. It reduces barite costs, it minimizes lost circulation costs and problems. It maintains mud pump efficiency and it actually makes possible the close control of mud weight and viscosity that results in faster drilling with increased safety.

CLAYJECTOR®

If you are using mud as heavy as 12 pounds per gallon, you can cut mud costs and increase drilling rate by using a Clayjector. This is a cyclone-type separation unit that is extremely effective at rejecting unwanted clays and retaining expensive barite.
In addition, since it makes possible the economical maintenance of a low-solids, low-viscosity mud, it actually permits a reduction in bit costs and drilling time.

D-SANDER®

The D-Sander greatly increases the life of mud pump parts and bits when sand or abrasive shale is being drilled. Since it removes virtually all sand-sized solids from the mud, excessive pump-parts and bit-nozzle wear — as well as many other problems — are avoided when a D-Sander is used. There is a size and type to fit every rig and drilling condition.

These descriptions tell just a few of the many ways you can cut costs by mechanical mud treating. For the full story on how you can profit, call your nearest SWACO representative or write us direct.

SWACO

SALT WATER CONTROL, INC.
707 FORT WORTH NATIONAL BANK BLDG., FORT WORTH 2, TEXAS
Telephone: EDison 2-4433 Cable Address: "SWACO" Fort Worth

LOUISIANA: New Orleans, Lafayette
OKLAHOMA: Oklahoma City
TEXAS: Houston, Corpus Christi, Fort Worth, Kermit
COLORADO: Durango

What's NEW

... in literature

Vertical multistage can-type pumps

Bulletin B-1710 discusses the pumps' flexibility in application to high-pressure injection service in water-flood operations. The Hydro-Line pump consists essentially of a multistage vertical centrifugal pump unit encased in a barrel, with suction and discharge nozzles in line. The bulletin further illustrates vertical lineshaft water-supply pumps for water-flood operations. It states that these units are capable of lifting water from depths as great as 2,000 ft. The literature includes another unit for pump applications involving low and medium pressures in flood-water-injection service. Source: **Peerless Pump, Hydrodynamics Div., FMC Corp.,** 301 W. Ave. 26, Los Angeles 31, Calif., U.S.A.

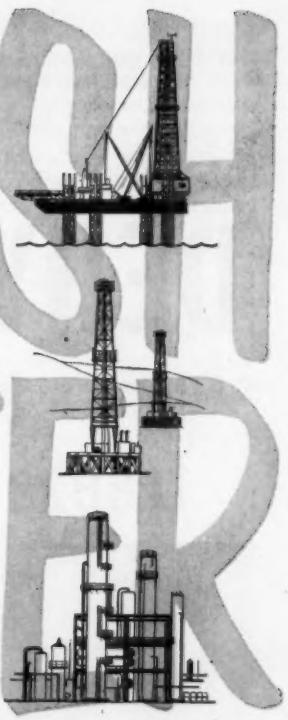
Water-flooding services

Water-flooding methods, a new booklet reports, are basically the same in that raw water must be procured, treated, pumped through a distribution system to injection wells, metered, and injected into a producing zone under pressure. However plants vary in size and design according to the size of the reservoir to be flooded and to the operator's method of approach. Twelve-page Booklet 1655-A features a three-step procedure in the planning and construction of secondary-recovery projects. Included are four pages of examples, consisting of diagrams and schematic drawings. Source: **Supply Div., Bethlehem Steel Co.,** 21 E. Second St., Tulsa, Okla., U.S.A.

Centrifugal contactors and solvent extractors

Just published, Brochure P-100 includes a discussion of chemical reactors, separators, and clarifiers. Operating principles of these countercurrent, liquid-liquid and vapor liquid machines are described with the help of illustrations and diagrams. A comprehensive section on applications includes process flow diagrams, installation photos, and a list of operating advantages.

FRESH WATER

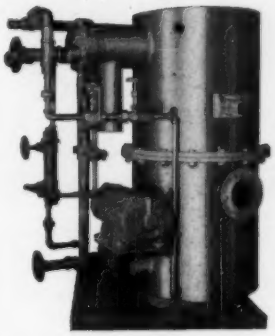


FUEL-FREE . . .

FROM SALT

OR BRACKISH

WATER



Wherever there is a supply of salt or brackish water, AMF-Maxim Aquavap heat recovery evaporators provide a practical, economical way of producing fresh water of purity exceeding U.S. Public Health Service requirements. These compact evaporators operate on engine jacket water or any other hot water source, and thus add nothing to existing fuel cost. They are low in initial cost, inexpensive to maintain and simple to operate, and are delivered as a complete packaged unit ready to install. Capacities range from 150 to 12,500 gallons per day of fresh water.

For further details write Dept. O for this new Aquavap Bulletin.

AMF MAXIM EVAPORATOR DIVISION

American Machine & Foundry Company

WATERFORD, CONN. • Branch, DENVER, COLO.

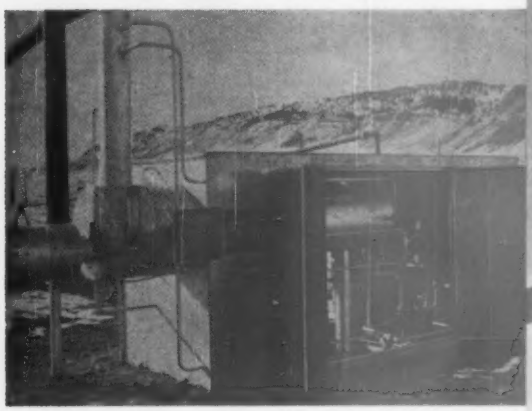
Represented by THE J. B. BEAIRD COMPANY

Shreveport, New Orleans, Tulsa, Midland, Houston, New York

This ESKIMO Dehydrator is located in the Big Piney Field, Western Wyoming.

DEHYDRATION

till Hell freezes over



with ESKIMO

The ESKIMO — BS&B's Economy Glycol Dehydrator — is a self-contained unit, housed and protected against extremely low ambient temperatures.

This unit has 3-phase resolution of the well stream and 65° dewpoint depression of effluent gas. It is equipped with flame arrestors for maximum safety against fire hazards.

ESKIMO is available in 2 MMSCFD and 4 MMSCFD units with 2 or 3-phase integral scrubbers, and operates on an unattended basis.

Ask your BS&B man about ESKIMO or write to Black, Sivalls & Bryson, Inc., Dept. 1-A6A, P. O. Box 1714, Oklahoma City, Oklahoma.

BS&B

BLACK, SIVALLS & BRYSON

OKLAHOMA CITY • EDMONTON • LONDON • PARIS • THE HAGUE

Petroleum-industry uses include: sweetening of gasoline, separation of salt water from crude in offshore drilling, and deasphalting. Source: **Podbielniak, Inc.,** 341 E. Ohio St., Chicago 11, Ill., U.S.A.

Automatic chart changer

Dial-O-Graph, the bulletin reports, is a simple attachment that makes a circular chart-recording instrument fully automatic in operation, permitting it to run unattended for days or weeks at a time. The publication notes that any conventional make, model, or type of recorder can be converted to Dial-O-Graph. Completed charts are stored in chronological order in a metal chart catcher mounted below the instrument. Source: **Mullins Mfg. Co., Inc.,** 3311 W. Davis, Dallas 11, Tex., U.S.A.

Save money, time with metallizing

Available free, this six-page folder uses the case-history approach, with nine separate stories of cases where products were salvaged or improved with modern metallizing. Examples cover flame spraying with metals in both wire and powder form. The publication suggests that a plant does not need a metallizing installation if it takes more than a year to pay for itself. In that event, the advice is, use the services of a local job shop. Source: **Metco, Inc.,** 1101 Prospect Ave., Westbury, L. I., N. Y., U.S.A.

High-pressure valve

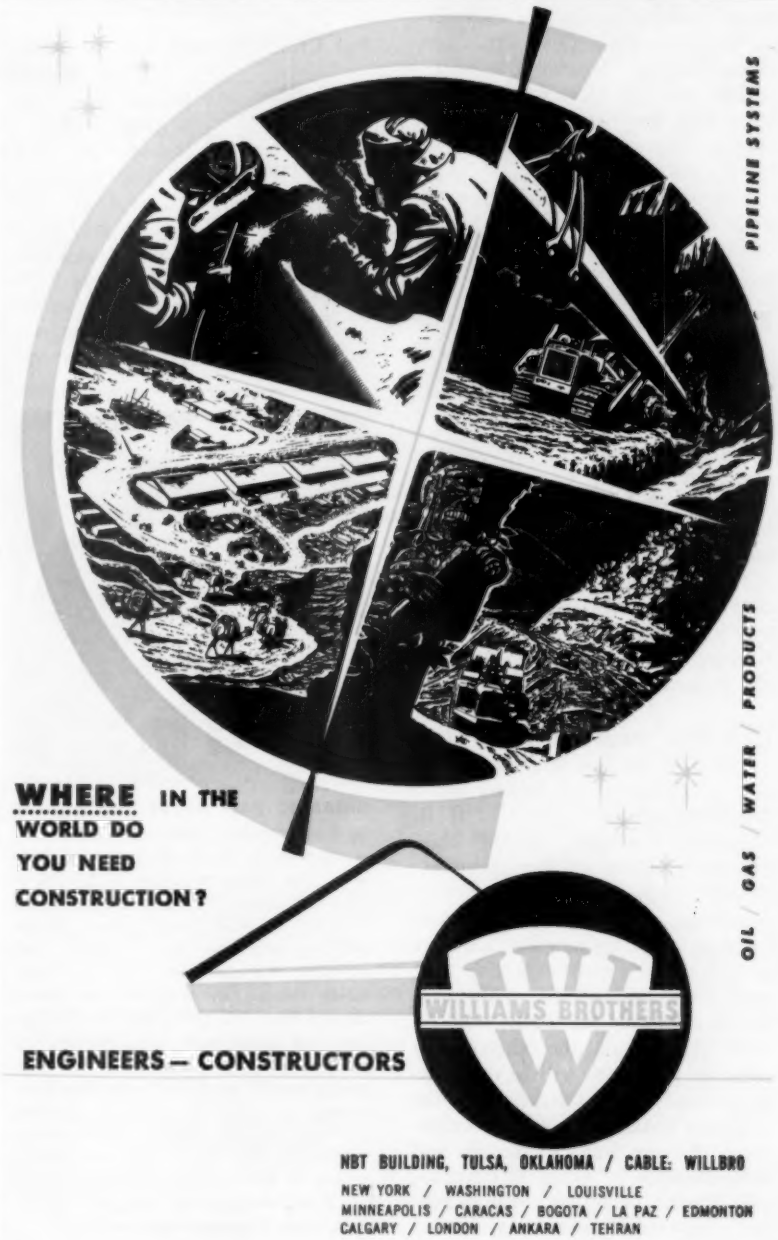
Publication SRM 709.21 details the redesigned V6 valve, a diaphragm-actuated unit, designed to handle high-pressure steam, water, gas, oil, and air on "open and tight shutoff" applications. The bulletin describes the unit in detail, cites operating advantages, and includes a diagram of the valve. Source: **Republic Flow Meters Co.,** 2240 Diversey Parkway, Chicago 47, Ill., U.S.A.

Vertical and horizontal tank heaters

According to this eight-page publication, both types of heaters use "one-weld" single-pipe construction, eliminating needless weight and welding associated with manifolds and headers. This feature permits the heaters to be carried easily over rough ground around a tank farm by only two men, the bulletin reports. Use of heavy-duty aluminum fins spaced six to an inch on 1-in. Schedule 40 steel pipe is said to assure high heating capacity. Source: **Griscom-Russell Co.,** 185 Wetmore Ave., S. E., Massillon, Ohio, U.S.A.

Water-gel temporary plugs

A new two-page product data sheet describes plugs for economical selective acidizing of long pay sections. The plugs are slugs of gelled water which may be injected before and between batches of acid in the acidizing of wells. According to the data sheet, the gelled water is used to shut off the more permeable zones temporarily so that the benefits of the acidizing treatment may be extended to the less permeable zones. The literature tells how the product is used and offers advantages, physical properties, and case histories. Source: **Dowell Division of The Dow Chemical Co.,** Box 536, Tulsa, Okla., U.S.A.


PIPELINE SYSTEMS
OIL / GAS / WATER / PRODUCTS
WHERE IN THE WORLD DO YOU NEED CONSTRUCTION?
WILLIAMS BROTHERS
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▶▶▶ Equipment Men Notes

Ralph N. Brodie Co. appoints . . . E. R. Bjornestad as southwest division manager in Dallas, succeeding J. J. Kropp, Sr., who retired after more than 25 years with the company.

E. R. Bjornestad

In his new capacity, Bjornestad is responsible for administration and direction of BiRotor meter and Brodie control-valve sales and service in Texas, Oklahoma, Louisiana, Arkansas, and Tennessee.

The new division manager has been with the San Leandro, Calif. company for several years. Prior to his Dallas appointment he was assistant division manager in Los Angeles. He has also served as a field engineer in both the Los Angeles and Dallas divisions.

R. L. McCelvey is sales manager . . . of Electrodynamic Instrument Corp., Houston, it was announced by President Paul E. Madeley. Robert McCelvey was formerly in charge of EIC's military department. Before joining EIC, he was with Texas Research Associates and Southwestern Industrial Electronics Co.

R. L. McCelvey

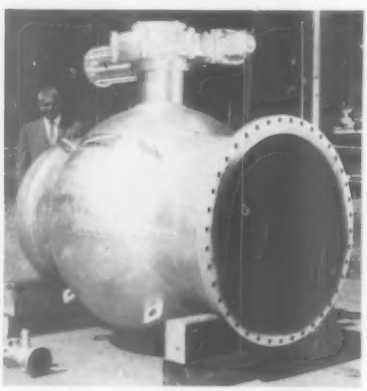
Lone Star Steel Co. elects . . . Max R. Dodson to an executive vice presidency, and renews for a 5-year period the contract of E. B. Germany, president, as the chief executive officer of the company. Dodson, who formerly was vice president, controller, and assistant treasurer, assumes new duties as one of Lone Star's two executive vice presidents. He will be responsible for all corporate fiscal matters.

W. H. Johnson, the other executive vice president, will be responsible primarily for operation of the company's facilities and development of Lone Star's expansion and diversification program. In other reassignments of officer responsibilities, Howard Jensen was elected vice president, general counsel, and corporate secretary. He previously was vice president, legal.

Continental-Emsco Co. becomes . . . authorized export distributor of Floco positive-displacement meters and other oil-field products manufactured by Flow Equipment Co., of Santa Fe Springs, Calif. Distribution will be through Continental-Emsco's stores and agents in all oil-producing countries throughout the free world.

Pat Childs named v.p. of sales . . . for Harold Brown Co., according to Harold Brown, president of the Houston-based oil-tool firm. Childs, a graduate of Texas A&M, was sales manager of the company before his advancement.

Pat Childs



GIGANTIC BALL VALVE manufactured by Cameron Iron Works, Inc., Houston, is checked by T. D. Basham, of Cameron. The valve measures 42 by 36 by 42 in., flanged end and welding end. It is 300 lb. ASA classification, 720-lb. working pressure, and 1,100-lb. test pressure. It's equipped with a 175-lb. 42-in. flange, as the pressure downstream from this valve will be negligible. This valve was manufactured for an oil operator to be used as an emergency shutoff on a 42-in. pipeline from storage on shore to a marine loading platform located offshore in the Mediterranean. By way of comparison, shown in the foreground is a 2 by 1½ by 2 in., flanged by flanged, 600-lb. ASA class Cameron ball valve.

Robert M. Johnson becomes . . . district sales manager of Stupp Corp.'s Denver office, according to Howard E. Midkiff, sales manager. Johnson has been employed as a field service engineer in Denver the past 2 years. Earlier he was field service engineer at Great Bend, Kans. and Farmington N. M.

R. M. Johnson

Ideco "Road Show" in progress . . . includes a mobile display of oil-field drilling, servicing, and workover equipment. The 5-month tour will take the Ideco equipment through oil areas in Louisiana, Texas, Oklahoma, Kansas, North Dakota, New Mexico, Colorado, Montana, Wyoming, Mississippi, Alberta, and Saskatchewan.

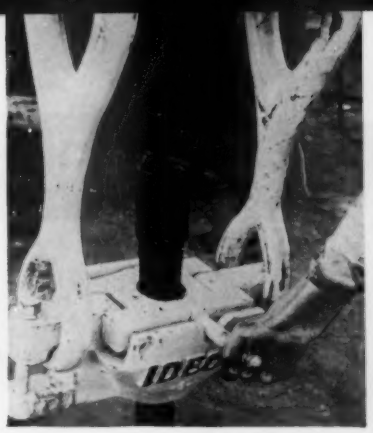
A field motion picture report of Ideco's dual-speed system for handling tubing and drill pipe is being shown at regular intervals at all tour stops. Models of the company's mud pumps, as well as a cutaway section of a mud-pump pot, gears, and bearings, may be seen in the exhibit. Literature on Ideco equipment is available.

Daystrom names James Burr . . . as marketing manager of its Control Systems Division, replacing John A. Palmer. The announcement was made by Paul G. Miller, general manager. Burr's appointment is part of a reorganization of the marketing, engineering, and analysis departments at the La Jolla, Calif., laboratories.

Other new staff appointments include: Dr. Charles Taylor, named technical staff assistant to Miller; and Bruce Baldridge, new manager of systems analysis. Emmanuel J. Otis continues as manager of engineering, with his department now including applications engineering and technical publications.

Grove Valve & Regulator hosts . . . 23 representatives from pipeline and petroleum companies throughout the world as a part of an annual pipeline school sponsored by

DUAL-SPEED BLOCK is hoisting another stand as freed stand is being racked.



AUTOMATIC ELEVATORS remain around tubing at all times during trip.

Ideco Dual-Speed System . . .

Saves 30% to 50% Trip Time!

Running or pulling four 30′ stands of tubing a minute has proved to be average time for a rig equipped with the Ideco Dual-Speed System. Field reports from Texas and California indicate that the system will reduce by 30 to 50 percent the time normally required to round trip a string of tubing.

Major Advantages

The Dual-Speed System has proved to be faster, safer and more economical than the conventional method. Crews working with the system say they work faster, but the work is much easier. After one round trip, average crews are proficient in operating the Dual-Speed System and they are enthusiastic about the ease of operation.

Basic Equipment

The Ideco Dual-Speed System utilizes a divided-type traveling block with an "Open-Swivel" link adapter, automatic elevators, and a transfer elevator.

Trip time is greatly reduced because the traveling block and elevators move up and down in almost continuous motion. This eliminates the time required with a conventional system when making or breaking a connection. The transfer elevator supports the pipe when "setting-back or stabbing" a joint.

The Dual-Speed System is available with either two or three-sheave blocks equipped with Ideco Fabriform sheaves mounted on Timken tapered roller bearings. The "Open-Swivel" adapter has an 8½″ front opening and a 12″ diameter center bore that allows sufficient space for running tubing, gas-lift valves, tools and other equipment. The swivel adapter can be rotated 360 degrees and can be locked in seven positions.

Principles of Operation

In coming out of the hole, a stand is hoisted, the slips are set, and the traveling block started down while the crew is breaking out the joint. The automatic elevators remain around the tubing at all times. As the traveling block is falling, the derrick man slips the transfer elevator around the stand. As soon as the elevator passes the broken out joint, the tong man actuates the hydraulically-operated transfer elevator. This lifts the freed stand out of the collar and allows it to be set back in the racking platform while another stand is being hoisted by the Dual-Speed Block. The procedure is reversed when going in the hole.

COMING OUT OF THE HOLE . . . traveling block is on the way down as the 60′ stand is being broken out on this "doubles" mast. Derrick man is attaching transfer elevator.

Idle block time is reduced almost to zero, for the pipe is not supported by the traveling block while a connection is being made or broken.

Ask the Ideco representative in your area to show you the DUAL-SPEED SYSTEM motion picture field report.

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the American Petroleum Institute. Companies from England, Israel, Italy, Iran, Mexico, Venezuela, and Canada attended the seminar. Highlight of the 3-day field trip to Grove headquarters in Oakland was a step-by-step explanation of how valves and regulators are manufactured, from raw material to finished product.

Geophysical Service, Inc. opens

. . . a new supervisory office in Brisbane, Queensland, Australia. GSI is a petroleum exploration subsidiary of Texas Instruments, Inc. C. M. Moore, Jr., vice president in charge of GSI's Eastern Hemisphere operations, said the office would be headed by E. J. Malovich.

Malovich will be responsible for the firm's seismic and gravity-magnetic exploration activities in Australia. He has been with the firm since 1950 and has served as a supervisor in Australia since 1957. Prior to going to Australia he supervised GSI seismic field parties in India.

R. C. Schulze named sales v.p.

F. C. Schulze

. . . of Waukesha Motor Co., it was announced by C. E. Nelson, president of the Waukesha, Wis. builder of engines and power units. The company's general sales manager the past 12 years, Schulze now will direct and coordinate sales efforts throughout the country and in foreign markets. He joined the firm in 1928 and became assistant sales manager in 1938.

Hycalog, Inc. appoints pair

. . . to new positions. W. H. Peters has become district manager of the Michigan division with headquarters in Mt. Pleasant, Mich., and James A. Latham, consulting petroleum engineer of Shreveport, has been named consultant.

With Hycalog since 1949, Peters has served for a number of years as manager of a well-logging unit throughout the Southwest. Prior to his new appointment he was in

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charge of the Hycalog core-analysis laboratory in Laurel, Miss. Latham will advise on reservoir-engineering problems, special research projects, and special petroleum - engineering requests from Hycalog customers.

C. H. Wheeler Mfg. Co. sets up

. . . a western regional sales office in San Francisco to provide a closer relationship with customers and sales and service efficiency in an 11-state region. Elbert E. Baker, vice president of the company, has been appointed to direct the region's operations. The new office also will assist with West Coast sales activities of Wheeler's affiliate, Griscom-Russell Co.

Schlumberger makes 3 shifts

J. A. Bodin

. . . in top field managerial positions, naming J. A. Bodin, I. L. Roberts, and G. C. Hepburn to new posts. Bodin, former manager of the corporation's Northwest Texas area, has been named manager of the southwest area, succeeding Alan Morazzani who moved up to the presidency of Johnston Testers, Inc.

Roberts, succeeding Bodin as Northwest Texas area manager in Fort Worth, previously was manager of the Louisiana Gulf Coast division in Lafayette. Before that Roberts served as Texas Gulf Coast division manager and held several field engineering and managerial positions in Texas and Illinois. Hepburn moves to the Louisiana Gulf Coast division manager's post replacing Roberts. He goes to his new division offices from Evansville, Ind., where he served as northeast division manager the past 2 years. Hepburn joined Schlumberger in 1947.

I. L. Roberts

G. C. Hepburn

TI PROCESS CONTROL SYSTEMS

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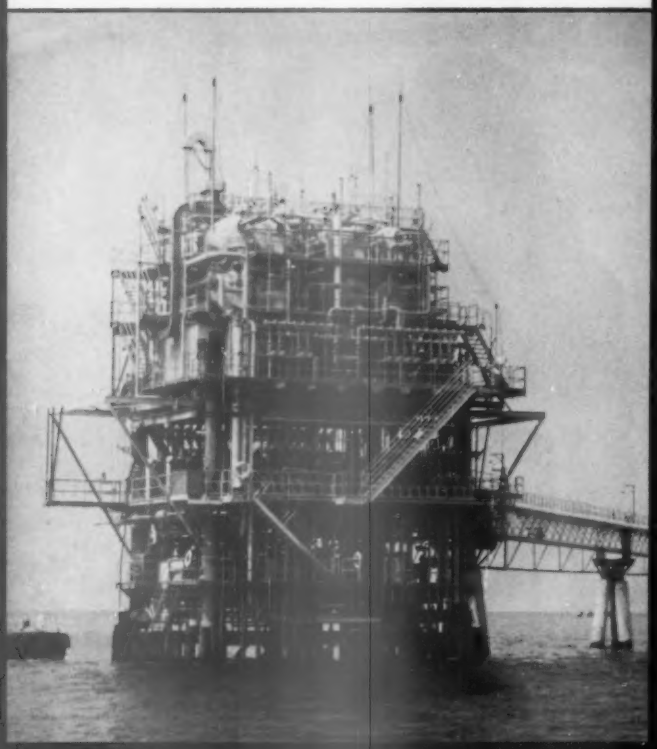
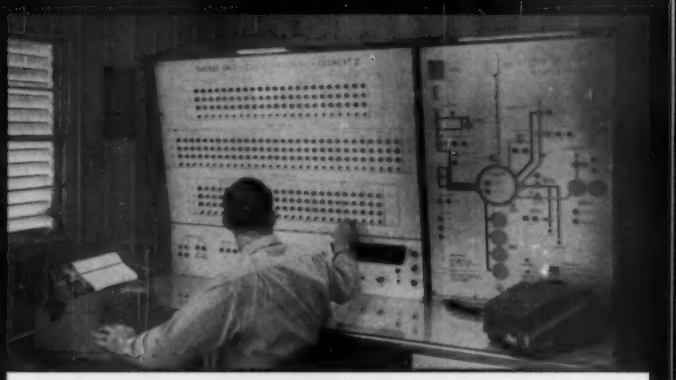
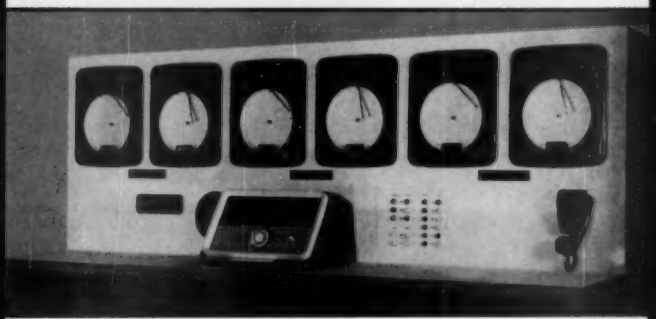
Unattended crude gathering station in Venezuela's Lake Maracaibo automatically controls production of 48 completions.





SACROC supervisory control system in West Texas automatically tests wells, records all data over entire 76-well project.



On-shore console supervises and controls automated offshore producing platform near Corpus Christi, Texas.

Electronic equipment designed, built and installed by Texas Instruments controls the *unattended* production of crude in locations throughout the world. In the Lake Maracaibo installation, for instance, TI's process control system monitors flow and pressure from each completion; monitors and controls all functions of flow station operation, including automatic start-up, shut-down and well testing; and throughout the entire 100,000 BPD operation logs complete records of production and testing into punched paper tape.

In case of a malfunction — for example, a pump or engine failure — the system analyzes the situation, takes corrective measures, and sends classified alarm information to the remote monitoring station by radio. A maintenance engineer can then go to the seat of the trouble without repeating corrective measures already taken automatically. TI has recently contracted to provide the electronic equipment on two similar flow stations in Lake Maracaibo.

For West Texas' SACROC field, *the country's largest unitized oil producing operation*, TI designed a supervisory control and data gathering system that provides automatic and manual control for testing any of 76 wells, returning it to production or shutting it in. Wells on test are subjected to gas, oil and water separation with resulting data printed out in the central console.

Texas Instruments experience and abilities in petroleum automation systems are being applied in many fields of industrial process control and automation. TI's capacity for design and application of precise instrumentation assures efficient handling of the most complex projects.

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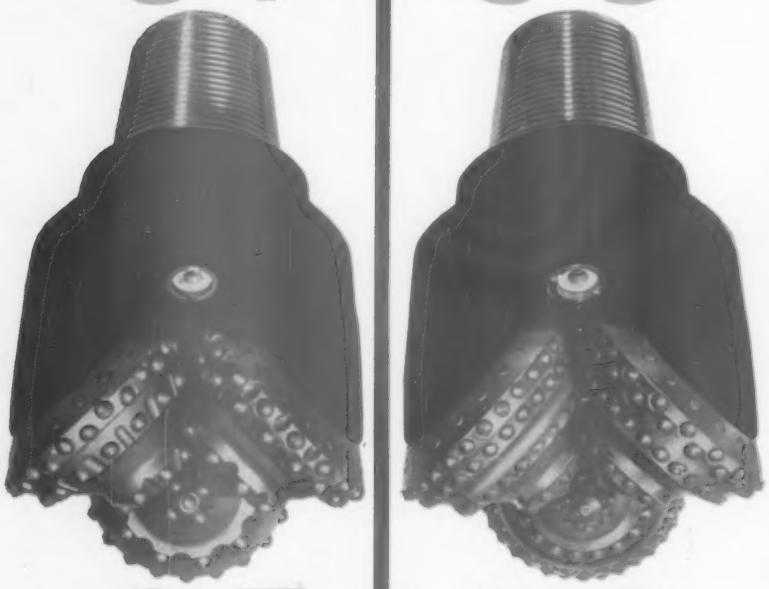

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Abo trend area, Lea and Eddy counties, New Mexico

DATA ON ACTIVE FIELDS

1. Approved field names: Empire-Abo and Lovington-Abo. There are 16 fields in New Mexico and 2 in Texas along this trend which extends from Eddy County, New Mexico, to Gaines and Yoakum counties, Texas. Only two of these are discussed in detail to show representative conditions at opposite ends of the trend (see OGJ, May 1, 1961, pp. 184, 185).

2. Discovery dates: Empire was opened in November 1957 by Pan American and Hondo Oil & Gas Co. 1-A Malco Refineries, 11-18s-27e, Eddy County, New Mexico. Lovington was discovered by Skelly Oil Co. in December 1951. It was about 6 years later that an active development program continued.

3. Trend of development: East-west.

4. Number of producing wells: Empire, 209 wells. Lovington 42 wells. There are more than 300 wells in all the fields with additional drilling continuing.

5. Spacing pattern: 40 acres.

6. Proved acreage: Empire 8,360 acres. Lovington, 1,700 acres.

7. Principal operators in area: Pan American; Hondo; Humble; Skelly; Amerada; British-American; Carper Drilling; Cities Service; Grover, McCurdy & Knox; Hudson & Hudson; S. J. Iverson; Kewanee; Leonard; Phillips; Sinclair; Western; and Yates.

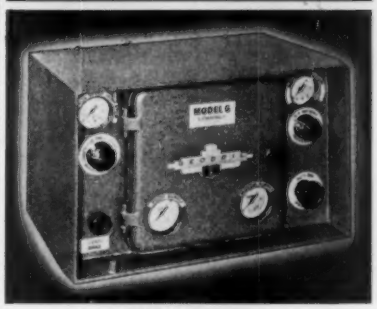
8. Present allowable: Empire 60 bbl. of oil per day. Lovington 102 bbl. of oil per day.

9. Number of active drilling rigs: On the entire Abo trend it is estimated that there are about 40 rigs working.

10. Casing program: 13⅜-in. surface set at 310 ft. with 300 sacks cement. 8⅝-in. intermediate set at 4,580 ft. with 500 sacks cement. Oil string is 4½ or 5½-in. set at TD with 150 sacks. Total depth varies from 5,000 to 6,300 ft. at Empire. Use of intermediate string is occasional.

11. Average drilling time per well: 15-30 at Empire. 40-45 days

MORE HOLE PER DOLLAR



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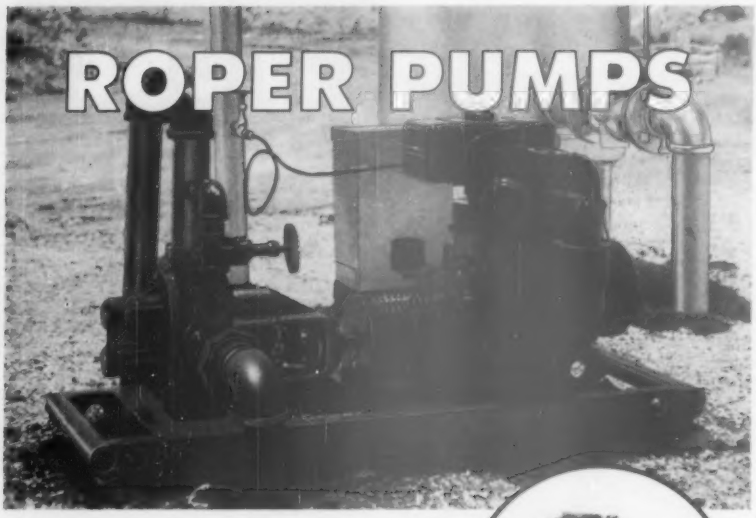

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OPERATING CAPACITY: 50 BBL/HR @ 50 PSI

With this type circulating unit you need not dispose of tank bottoms on roads or by burning. You can circulate and recirculate tank bottoms to salvage useable crude from residue. This unit (assembled by Harley Sales Co., Tulsa, Okla.) consists of a Roper Series 3600 #2A pump direct connected to a gear box on a Wisconsin engine. Special variable by-pass allows operator to control volume of fluid going through heater treater. • Roper pumps can be equipped with totally enclosed anti-friction bearing reduction assemblies for high-speed operations. Three gear ratios interchangeable in each size are available. Mechanical seals, built-in relief valves, and steam chests are among the optional features you can get on your Roper pumps.

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SHAFTS: All shafts, precision ground steel, are induction hardened at bearing and packing surfaces.

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at Lovington.

12. Types of drilling fluid: Bentonite and salt gel. Average cost $5,000.

13. Completion methods: Perforate casing with four shots per foot. Formation is acidized with 500 to 20,000 gal.

14. Number, type and size of bits: 15-18 rock bits, 7⅞-in.

15. Special drilling problems: None reported.

16. Producing formation and depths: Abo reef. At Empire, depth is 5,200 to 6,300 ft. At Lovington, depths range from 8,000 to 8,500 ft.

17. Reservoir characteristics: Empire is not known. Gas-oil ratio: From 783 to 1,400/1. Oil-water contact: −2,550 to −2,670 ft. Gas-water contact: Nil (?). Lovington is water drive. Oil-water contact: −45 to 20 ft. Gas-water contact: Nil (?).

18. Geologic markers: An Empire well recently completed had the following tops: Seven Rivers 459 ft.; Queen 995 ft.; Grayburg 1,426 ft.; San Andres 1,787 ft.; Glorieta 3,150 ft.; and Abo 5,355 ft.

19. Type structure: Stratigraphic reef barrier with some minor structural consideration.

20. Core data: Abo, Porosity 1.5-18%. Permeability 0.1 to 1,970 md. Residual-oil saturation 40-80%. Total water saturation 25-60%. Net feet of pay 10-711 ft. Oil column: Empire 70% by vol. of total. Lovington 20% by vol. of total reservoir.

21. Estimated recovery: 300,000 to 1,000,000 bbl. per well. Average is 600,000 bbl. per well. Empire, 100 bbl. per acre-ft. Lovington, 150 bbl. per acre-ft.

22. Pressures: 200 to 1,200 psi., tubing.

23. Tests and logging procedures: Drill-stem test pay formation and gamma-ray-neutron log(s) run from surface to TD.

24. Average costs: **Empire:** Dry hole $65,000. Completed well $85,000 to $100,000. Average total depth 5,200 to 6,300 ft.

Lovington: Dry hole $90,000. Completed well $140,000. Average total depth 8,000 to 8,500 ft.

Completed well on turnkey contracts: $70,000 to drill, less lease equipment.

Average lease price: $50 to $1,100 per acre.

Dowell provides electronic computer calculations to help operators select best frac treatments

Dowell's new electronic computing service is now providing rapid calculations – based on the Frac Guide* – to help operators select fracturing treatments best suited to their needs and available funds. This new service by Dowell costs you nothing extra, yet it offers operators new opportunities for greater profits from fracturing.

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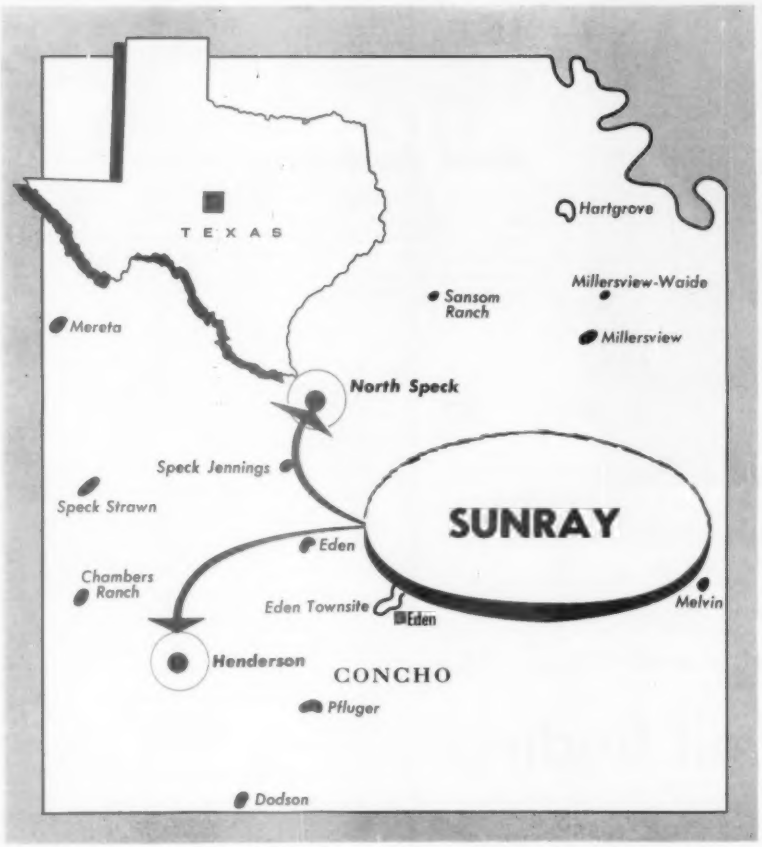

TWO 1961 DISCOVERIES by Sunray have restored Concho County, Texas, to flowing oil production.

Texas' on-again-off-again county now on again

BY FRANK J. GARDNER

JUST WEST of the geographical heart of Texas lies Concho County. It's on the northern edge of the Edwards plateau, and the Brady Mountains lace it west to east. It's always been sheep and goat country for the most part, but off and on it's been oil country too.

One success . . . Right now, it's "on" again. Until recent months, the county's 11 oil fields had dwindled to only 4—all the others had been abandoned, and interest in Concho County was nil.

Then, in March of this year, Sunray Mid-Continent Oil Co. discovered the two-pay North Speck field, 8 miles northwest of Eden; first completion was at the 1 R. L. Carter in Strawn-Pennsylvanian sand at 3,574-88 ft., with a potential of 185 bbl. per day of 46.2° oil on 12/64-in. choke. On May 1, Sunray dually completed the well in Canyon-Pennsylvanian at 3,191-3,206 ft. for a pumping potential of 70 bbl. daily plus 44 bbl. of water. The discovery was in Section 157, Block 72, T&NO Survey. Total depth was 3,992 ft.

Sunray now has finished two offsets to the North Speck strike: the 1 Cox, ⅜ mile northeast of 1 Carter, producing from both Canyon and Strawn, and the 1 Kitchens, a ½-mile southeast stepout Strawn producer. Both are flowing wells, with Strawn potentials of 125 bbl. and 152 bbl. daily, respectively.

Leads to another . . . Yet another Sunray success now appears in the southwest corner of Concho County. At its 1 J. E. Henderson, Section 55, Block 8, H&TC Survey, the operator has opened Hope lime pay (upper Cisco-Pennsylvanian) at 2,393-2,401 ft. Potential at this new strike was 85 bbl. per day of 39° oil on pump. Dual completion has not been made at this new field discovery, although a good showing of oil was obtained on drill-stem test of Palo Pinto-Canyon sand at 3,332-43 ft. Total depth of the 1 Henderson is 4,320 ft.

Concho County has never been a really big oil producer. Its cumulative production is only about 175,000 bbl. Prior to the Sunray discoveries, only seven oil wells and two gas wells were on production*; total daily allowable for the seven oilers was a mere 58 bbl. The two new fields will boost production by more than 500%. But if these new wells follow the historic Concho production pattern, field life will be short. Pfluger, longest-lived field in the county, was found in 1951 and is producing 2 bbl. daily from a single well; average field life of the seven abandoned fields was a little over 4 years.

The best producer in the county has been Speck-Strawn field, discovered in 1953, with cumulative production of about 45,000 bbl. There are now two producers in the field, making 16 bbl. daily.

So, while the new Sunray discoveries are not exactly gushers, they are among the best wells yet completed in Concho County. Performance in the future will tell the story. This "teaser" area may well turn out to be just another in the long list of those whose possibilities have not been properly exploited in the past.

*Ha-Jo (not on map)	one oil
Speck-Strawn	two oil
Speck-Jennings	three oil
Pfluger	one oil
Eden Townsite	one gas
Hartgrove	one gas

About the author . . .

EDWARD A. KOESTER has been engaged in petroleum exploration since 1929 and is now a consultant in Denver. His fine career includes executive capacities with several oil firms and he is a past president of AAPG. He has been active in many professional organizations.

"What's the recipe for a successful exploration program?"

This author finds little change in the search for . . .

A formula for oil finding

BY EDWARD A. KOESTER
Petroleum Consultant, Denver

WHAT COMPONENTS determine success or failure in exploration for oil?

The answer may lie in a study of a representative group of companies in a restricted area for a period of 37 years. The study was first made in 1941, repeated in 1948, and now is revised to the beginning of 1960. It is significant that the formula for successful oil-finding expressed in 1941 requires no great change after 19 years.

The analysis of each company's exploration program and policies involves a study of:

- The size and type of acreage holdings and their nearness to current activity.
- The relative use of the various exploration tools (surface geology, subsurface geology, core drill, geophysics, etc.).
- The dependence placed upon the local staff in a company program.
- The relative willingness to support exploration by others.
- The aggressiveness or lack of it of each company.

The tests used in this study to determine the success of an exploration program are: (a) the number of discoveries made in this period by each company and the consistency in making them, and (b) the ability of a company to maintain or increase its daily production by exploration. Since the emphasis here is on exploration, any production secured through purchase or any increase caused by secondary recovery should be ignored. These items contribute to the success or failure of a company's operations, but they are not a measure of its exploration success.

This study shows that certain exploration policies and practices are far superior to others, not only in the discovery of new reserves but in maintaining and increasing production. That these policies and practices are available to any company is proved by the successes enjoyed by new companies that have adopted them.

The fact that the area chosen for study is Kansas is immaterial; the proper exploration policies, modified to some extent to suit local conditions, should be successful anywhere.

In the beginning. Some 8 million acres of land in Kansas was under oil and gas lease in 1941. Over 5,800,000 acres of this was owned by the 17 companies shown in Table 1. Their holdings varied from a high of 715,687 acres to a low of 92,500. The average holding was about 344,000 acres. This included large wildcat blocks with little geologic control, some carefully chosen blocks, and checkerboard leases in quarter sections and 80-acre units. Some of these leases were taken on broad regional subsurface trends, while others had been chosen after careful surface, subsurface, core drill, or seismic work. Some were taken on the basis of more or less vague, magnetic, or gravimetric leads. And a large part was leased solely because other companies had leases in the area.

Most of the leases were for 10 years and nearly all the others no longer than 5. The average cost was probably less than $2 per acre. Rental was uniformly $1 per acre annually.

Exploration Policies

The 17 companies under study included all the most active ones at that time or at least those whose investment in the state was represented by large lease holdings and exploration expenditures. They held about 74% of the leased acreage and were producing about 40% of the oil. In most cases they also had a considerable investment in pipelines and refineries.

Each company was analyzed back to 1923, regarding all phases of its exploration policy—the amount and type of acreage held, number and size of lease blocks, quality of these blocks, location of checkerboard acreage in "hot" or "cold" areas, density of checkerboard play, extent to which a company followed geology and geophysics in its operations, relative dependence upon surface mapping, core drill, or seismograph in the choice of its leases.

Equally important was company policy regarding the encouragement of exploration by the contribution of dry-hole money or the purchase of spreads around a wildcat promoted by an independent or another company.

Other matters studied were reliance on the judgment of the local exploration man and the continuity of local personnel.

Approaches differed. It soon became apparent that oil companies in Kansas had "played" the state in different ways. Some had collected their acreage in large blocks; others had followed strictly a checkerboard policy. A few had used one exploratory tool, such as the core drill or seismograph, almost to the exclusion of others. Many had encouraged exploration through purchase of spreads or the giving of dry-hole or bottom-hole money; others had done this sparingly or not at all. A few companies had made sporadic entries into Kansas during which they spent lots of money and then had followed up with periods of little or no activity. Some had operated in Kansas on a steady, consistent basis. Some had

TABLE 1—LEASE HOLDINGS, DAILY PRODUCTION, AND ACREAGE FACTORS, 1941

Company	Acreage	Production	Factor
A	150,000	581	258
Q	100,000	2,334	42
B	125,000	1,523	82
C	323,170	1,126	287
E	560,001	18,252	30
F	305,333	9,633	31
G	715,687	9,469	75
H	92,500	1,580	58
M	652,888	3,759	173
O	100,000	2,072	48
P	304,244	6,706	45
S	225,000	9,282	22
X	500,000	6,639	75
Y	310,304	6,036	45
Z	675,000	12,116	52
T	610,797	4,574	131
W	98,500	632	144
Total	5,848,424	96,314	

TABLE 2—ANALYSIS OF EXPLORATION POLICIES OF COMPANIES GROUPED BY ACREAGE FACTORS

Company	Factor	Description of Exploration Policy
		TOO HIGH GROUP
C	287	Many rank wildcat blocks and checkerboard. Heavy dependence on seismic work. Poor representation in active areas.
A	258	General checkerboard in all areas. Few blocks. Very conservative policy.
M	173	Widespread checkerboard, particularly in quiet areas. Few well-chosen blocks. Won't support wildcatting.
W	144	Mostly checkerboard in inactive areas. Lethargic attitude. Poorly supports wildcatting.
T	131	Good checkerboard in all areas. Strong dependence on seismic work for own wildcatting. Won't support wildcatting.
		HIGH GROUP
B	82	Thin active checkerboard. No blocks. Relies largely on subsurface geology and "follow the leader" policy.
G	75	Broad active checkerboard. Several well-chosen blocks. Aggressive periodically. Moderate support for wildcatting.
X	75	Broad checkerboard in all areas. Many poorly-chosen blocks. Not very aggressive. Inconsistent.
H	58	Spotted good checkerboard in active areas. Few blocks. "Follow the leader" policy. Not aggressive.
Z	52	Good checkerboard in all areas. Many blocks. Aggressive. Strong emphasis on seismic work. Moderate support for wildcatting.
O	48	Cheap checkerboard. Few blocks. General lukewarm policy. Reluctant to support wildcatting.
		NORMAL GROUP
P	45	Good checkerboard in all areas. Good core-drilled blocks. Aggressive. Liberal support of wildcatting.
Y	45	Checkerboard in all areas. Many well-chosen blocks. Good support of intelligent wildcatting. Aggressive.
Q	42	Mostly well-chosen blocks. Checkerboard confined to active areas. Emphasis on seismic work. Usually supports.
F	31	Many core-drill blocks. Moderate carefully chosen checkerboard in active areas. Aggressive. Normally supports.
E	30	Many well-chosen blocks. Good checkerboard in all active areas. Aggressive. Fair support for intelligent wildcatting.
		LOW GROUP
S	22	Mostly checkerboard. Few blocks. Lukewarm policy toward exploration and with respect to supporting wildcatting.

been most successful; others had met with costly disappointment.

Definitely each company had not enjoyed the same degree of success. What was the secret? How did the successful ones "play" Kansas? What **are** the components of a successful exploration policy?

In an effort to answer these and other questions, the term "acreage factor" was evolved. This is defined as the quotient of the number of acres under lease divided by the barrels of daily production in an area. Thus, a company with 100,000 acres and 1,000 bbl. of daily production would have an acreage factor of 100. Of course, a company's acreage factor will vary from time to time, even from month to month, as it adds or drops leases and as its daily production fluctuates. Naturally the acreage factor of a newcomer to the state may be expected to exceed that of an older one with established production. However, this yardstick can be used successfully in an analysis of exploration policies, as will be seen. Incidentally, in 1941 the excess of income over lifting cost of each barrel of oil was about $1 ($1.25 minus $0.25) so that the acreage factor for each company also represents approximately the number of days' production each year that was used to pay that company's rentals.

The term acreage factor was evolved because the author was interested in determining the proper amount of nonproducing acres his employer could afford to carry in Kansas with respect to its daily production and with respect to competing companies. The use of this criterion, somewhat artificial though it is, led to an interesting grouping of the companies involved in the study.

Table 1 shows the acreage factor of each company under study. Obviously there was a great difference in the factors, so an attempt was made to analyze this by the preparation of Table 2. Four groups became apparent: a "Too High group" with factors over 131; a "High group" with factors between 48 and 82; a "Normal group" with factors between 30 and 45; and a "Low group" including but one company, with a factor of 22. A brief description of each company's leaseholding policy and exploration program also is given in this table. Generally the companies in a group have similar characteristics.

Companies whose acreage factor seemed to be altogether out of line with that of the industry are included in the Too High group. These generally do not support wildcatting or do so sparingly; they have large lease concentrations in rank wildcat, inactive areas, both in blocks and in checkerboards; their blocks generally have been taken because of a strong reliance on geophysical methods or on little scientific data. Some had a very conservative policy regarding exploration in Kansas. An element contributing to some of the very high acreage factors was the fact that some companies had allowed their production to decline in Kansas while they were participating in the intense development of the Illinois basin.

The policy of the companies in the High group was characterized either by a lukewarm attitude or a tendency to "follow the leader"; i.e., to buy leases in an area because others took acreage there. Only one of the companies in this group could be described as consistently aggressive. It relied heavily on its seismic program to evaluate its many scattered blocks. Some of the other companies generally were willing to support exploration, but had little except subsurface information to justify it. The companies in this group were more generally represented in active areas than those in the Too High group.

Several companies were included in the Low group in the original study, but only Company S of the 17 companies is in that group. Its exploration program may be best described as inactive as of 1941. It held practically no blocks of leases and its checkerboard was relatively sparse both in active and inactive areas. It took a lukewarm attitude toward exploration and gave it very little support.

The companies in the Normal group had several things in common:

- Geological departments were well-grounded in surface and subsurface geology.
- Acreage was held in active areas and was tested from time to time by the hundreds of wells drilled each year.
- Generally this exploration was encouraged by giving dry-hole contributions.
- Each held a number of untested blocks of leases which had been chosen by one or more different geologic or geophysical tools.
- Operators were aggressively looking for oil.
- Local exploration personnel were given authority as well as responsibility in making decisions.

In 1941, any student of Kansas oil-field history would recognize the five companies in the Normal group as very successful or moderately successful. They had made discoveries that were not only important, but were also of some size.

(Editor's note: Concluding Part 2 will be presented next week.)

Southeast New Mexico continues to be leading activity center

Exploration and development, busy for the past year, show no signs of slackening in southeastern New Mexico.

In Eddy County, Sinclair Oil & Gas Co. is drilling ahead at 77 Turner "B" in the northeastern part of the county. A 2-hour drill-stem test at the well, located in C SW SW 30-17s-31e, flowed gas in 4 minutes and oil in 15 minutes. The well made 30 bbl. of oil during the first 15 minutes and 1,990 M.c.f.d. During the next 30 minutes it flowed 42 bbl. and 1,845 M.c.f.d. Another 40 bbl. flowed during the next 30 minutes plus 1,675 M.c.f.d. A total of 113 bbl. flowed in a 1½-hour period through ⅝-in. surface choke. Daily flow is 1,800 bbl.

This well is the confirmation try and diagonal northeast offset to Odessa Natural Gasoline Co. 1 El Paso-State, a February discovery that flowed 5,200 M.c.f.d. and 44 bbl. condensate per day.

Roosevelt County. David Fasken completed 1 Bernice M. Green, C NW SW 30-8s-38e, flowing 309 bbl. of oil per day through ¼-in. choke from perforations at 9,451-55 ft. in the Bough "C" Pennsylvanian. Location is 3 miles east of Allison field.

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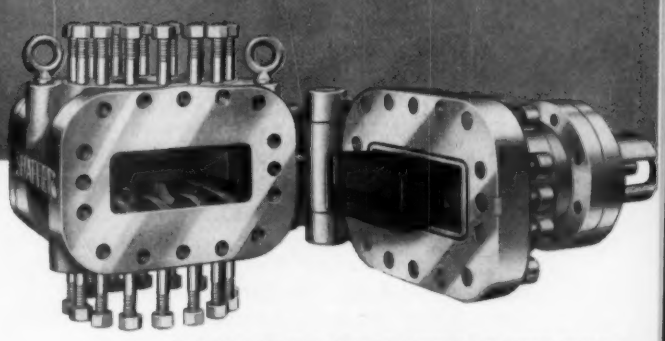

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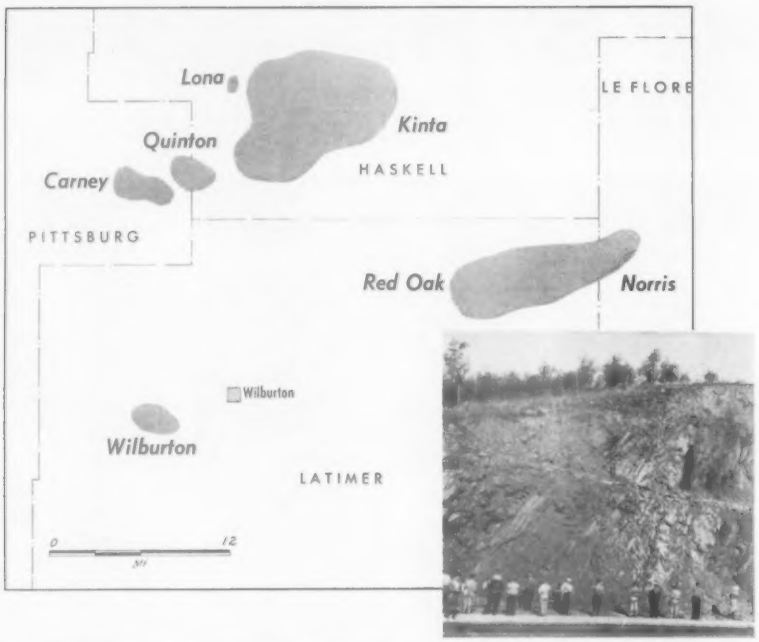
EXPLORATION OUTLOOK

Drillers probe deep in Arkoma basin



GEOLOGISTS study the Atoka at a roadcut in southeastern Oklahoma on a recent field trip. The Arkoma basin's chief pay, Atoka, is getting a thorough going over in current exploration.

THE much-talked-about Arkoma basin of southeastern Oklahoma is earnestly being drilled for deeper gas production. Deep exploration in shallow gas fields in southeastern Oklahoma in the past few months has tapped new gas reserves in five areas—Kinta, Wilburton, Norris, Carney, and Quinton.

The deep play began

. . . at Kinta where Superior Oil Co. opened Lona field north of shallow Kinta production and Ambassador Oil Corp. found basal Atoka gas on the south side of the area. Ambassador et al. 1 Davenport, NE SW NE 33-8n-20e, Haskell County, flowed 2,459 M.c.f.d. from perforations at 5,542-70 ft. The Ambassador crews also added production in Section 5-7n-20e. Later, Northwest Kinta field was opened by Apache Oil Corp. in 14-8n-19e.

Moved to Norris field

. . . on the Latimer-LeFlore County line where Midwest Oil Corp. 1 Orr, C SW 8-6n-22e, on the west side of the area, flowed 17 M.M.c.f.d. from the Red Oak part of the Atoka at 7,193-7,330 ft. The well also made 18 M.M.c.f.d. from the Spiro sand in the basal Atoka at 11,514-80 ft. New production followed this well in Sections 7, 9, 17, and 18. New production is indicated in Sections 10 and 16. Midwest is drilling on the east end of this area, the Brazil anticline, a large Arkoma basin structural feature, in 31-7n-23e. Republic Natural Gas Co. is busy in 34-7n-23e.

Then southeast of Wilburton field

. . . where Ambassador drilled 1 Williams in C NW 23-5n-18e. This discovery had an open flow of 8,300 M.c.f.d. from Spiro sand perforations at 8,811-31 ft. The second well here, 1 McAlester, C SW NE 22-5n-18e, flowed 7,592 M.c.f.d., running several hundred feet high on the basal Atoka. Perforations were at 8,288-8,328 ft. The Cromwell flowed 8,068 M.c.f.d. from 9,216-42 ft. Another test is starting in 3-5n-18e.

Back north to Quinton field

. . . in Haskell County where Mobil Oil Co. found dual zone production next to the field's shallow pay. The 1 Quinton, C SE NE 11-7n-19e, flowed 7,450 M.c.f.d. from Spiro at 5,862-5,920 ft.; 3,680 M.c.f.d. from Cromwell at 6,305-33 ft. Mobil is nearing pay at 1 Henderson unit in SW NW SE 10-7n-19e and Sinclair is drilling at 1 Bullard in C NW SE 4-7n-19e, keeping it a tight hole.

Southwest to Carney field

. . . in Pittsburg County where Apache Corp. found deep gas at 1 Etchison in NW SE NE 4-7n-18e. The Basal Atoka at 6,221 ft. gave up to 10 M.M.c.f.d. while drilling at this wildcat. Humble Oil & Refining Co. is looking at deep zones in Cartersville field, LeFlore County, at 1 Nelson unit, C SE NW 18-9n-24e. Depth target is 5,900 ft. Allied Materials Co. will drill to 7,000 ft. at a new wildcat, the 1 Simpson, C SW NE 20-10n-24e, 4 miles north of shallow gas production.

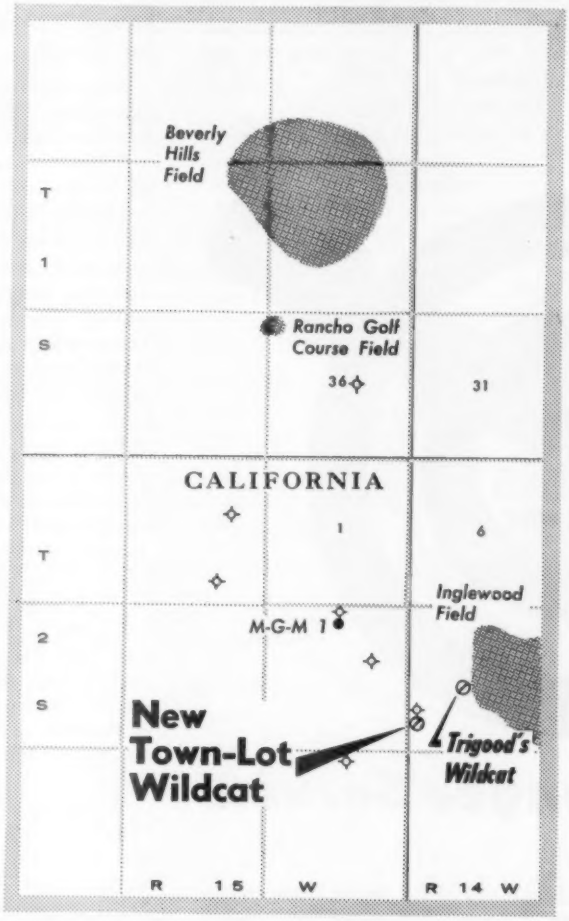
Into remote areas

. . . at Rock Island, Southwest Cartersville field, West Milton, and Brent. Midwest revived old Rock Island pool in eastern LeFlore County at 1 Morris, C SE NE 12-8n-26e. Atoka at 5,202-62 ft. was good for

1,800 M.c.f.d. LeFlore County Gas & Electric Co. got Spiro gas at 1 Holt in SW SW NE 33-9n-23e, Haskell County. This discovery, flowing 632 M.c.f.d., opened Southwest Cartersville field. West Milton field, still unconfirmed, was opened in 17-8n-23e, LeFlore County, and Brent pool, also unconfirmed, was opened in 5-10n-24e, Sequoyah County.

Arkoma has been picking up exploratory interest for the past 18 months, but things are just now really getting under way. Big gas wells are being reported on both sides of the two-state basin. The accent is on the deep Pennsylvanian pays in and around old shallow gas fields, but remote discoveries are in the cards too. Arkoma will undoubtedly be one of the year's exploratory highlights. We will be hearing a lot more of Atoka, Cromwell, and Spiro in the weeks to come.

—John C. McCaslin



TOWNLOT DRILLING in Los Angeles is back on the exploratory scene. Another wildcat is slated for a lease in West Los Angeles.

Town-lot wildcat scheduled in Los Angeles

ANOTHER wildcat will be spudded soon in an effort to prove up a town-lot lease in West Los Angeles that has produced a discovery well and three dry stepouts.

Standard Oil Co. of California will drill the new test, Culver City unit 101, on acreage farmed out from Continental Oil Co. Conoco discovered Culver City field on the Metro-Goldwyn-Mayer portion of the Culver City property, but has failed in three efforts to drill a confirmation well.

The Socal well will be drilled in 7-2s-14w at the same surface location of Conoco's last dry hole. The location is 4,000 ft. southeast of the discovery well, M-G-M 1. Socal will whipstock the new wildcat to a TD of 10,500 ft. in an effort to find the Miocene sands productive in the discovery well.

The movie-lot discovery tested 720 bbl. daily of 23°-gravity crude on a restricted choke when completed in November 1959. Flow is from the Puente formation at 8,660-8,807 ft.

Trigood Oil Co. is testing its Trigood-M-G-M 1 in Section 7 about ¼ mile northwest of the Socal location. The Trigood well was drilled to 7,031 ft.

The Culver City activity is about 2 miles south of two of Los Angeles' best town-lot fields, the Rancho golf course acreage held by Signal Oil & Gas Co. and Beverly Hills field on the 20th Century Fox acreage being developed by Universal Consolidated Oil Co.

Louisiana's Pendleton field extended southeast

In North Louisiana's Sabine Parish, W. A. Williams, Many & Associates extended Pendleton field 1 mile southeast at 1 W. C. Anderson, 16-6n-12w. The well flowed 239 bbl. of 43.5°-gravity oil per day through 12/64-in. choke from Saratoga perforations at 3,000-3,117 ft.

First oil at Ruston. Harvey Broyles and Perry G. Holloway & Associates 1 Mattie Sue Barham unit, 12-19n-3w, Ruston field, Lincoln Parish, is the first oiler for that field.

The well flowed oil on drill-stem tests in Hosston at 7,917½-24½ ft. and gas from the Feazel sand at 9,132-36½ ft. Operators are running two strings of tubing for dual completion. This well is ¾ mile northeast of production, a Vaughn Cotton Valley gasser at Southwest Gas Producing Co. 1 Lewis, NW SE 13-19n-3w.

Texaco completes offset to gas-well-turned-oil-well in California

Texaco Inc. has completed another gas well offsetting the only oil well in California's Sacramento Valley.

The 3 McCune in Sec. 32-8-1e in Solano County was completed flowing 1,500 M.c.f.d. from perforations between 5,472-90 ft. The well is the northeast offset of the 1 McCune, which began flowing crude oil after being shut in for 6 months. The 1 McCune was completed as a gas well.

Texaco has completed another offsetting gas well on its McCune lease, but neither of the offsets has followed the discovery-well pattern and started producing oil.

Australia test is abandoned

Delhi-Santos Mornington Island, Queensland, Australia, stratigraphic test No. 1 is being plugged and abandoned at a depth of 2,764 ft. after encountering granite.

As geological studies indicate that several faults exist between this location and the northeastern portion of the island, a location for a second stratigraphic test has been selected approximately 20 miles east-northeast of the No. 1.

Roads are now being cleared for movement of the rig and equipment.

One new pool, two extensions for Illinois

One new oil pool, Assumption Central in Christian County, was discovered in Illinois in May.

There were two extensions to pools, one each to Whittington pool in Franklin County and Pankeyville pool in Saline County.

A total of 92 new oil and gas tests was completed in the 4-week period. The new tests resulted in 35 oil wells, a success ratio of 38%. In addition, nine wells that previously had been completed as dry holes were reworked or deepened and recompleted successfully, seven as oil wells and two as gas wells.

Another good Silurian lime well was completed in Kellerville pool in Adams County, the R. F. Starr 3-A Mildred Milliron in 12-2s-5w, total depth 653 ft. Top of the Silurian lime was at 622 ft. with the pay zone from 632 to 641 ft. Initial production was 115 bbl. of oil a day. Anchor Production Co. completed its 4 Snow in the same section for 40 bbl. of oil a day from Silurian lime.

In Eldorado Consolidated pool in Salina County, Louis Kapp drilled the 2 Wayne Sutton Community well in 16-8s-7e, to a total depth of 2,291 ft. and completed it for 290 bbl. of oil a day flowing through ⅛-in. choke, from the Aux Vases sand. Five additional wells have been completed in this immediate area since the beginning of the year. In some of the wells an appreciable amount of gas is produced along with the oil.

Important Uinta basin well confirms Island unit strike

The second well on Utah's Island unit, Uintah County, flowed 1,600 M.c.f.d from perforations in Wasatch Tertiary at 7,078-7,104 ft. Mountain Fuel Supply Co. 2 Island unit is located in NW NW 14-10s-18e.

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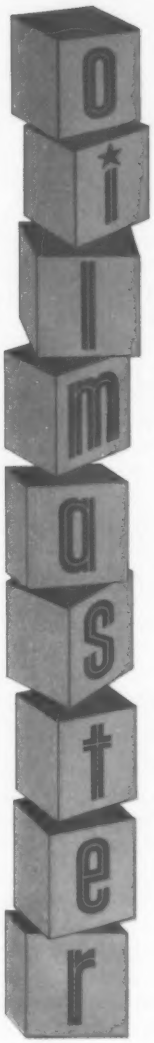

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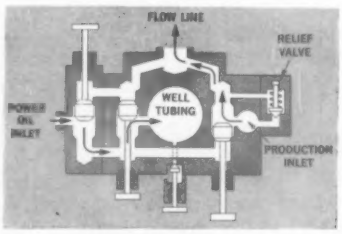
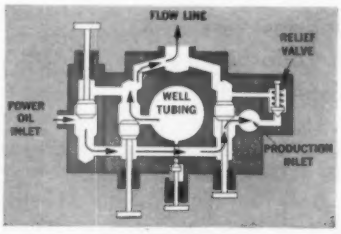
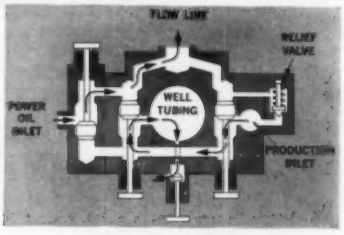
for the full story on Oilmaster Hydraulic Pumping Systems, see your local Oilmaster or distributor representative or write Fluid Packed Pump, Armco Steel Corporation, 9100 S. Norwalk Blvd., Los Nietos, Calif.



PUMP IN & OPERATE



PUMP OUT



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ARMCO Fluid Packed Pump

Wyoming's Wind River basin has new Tertiary gas pool

A LOWER Fort Union Tertiary gas discovery in central Wind River basin, Fremont County, Wyoming, flowed 2,591 M.c.f.d. from perforations at 9,138-44 ft. The well is Shell Oil Co. et al. 1 Dinty Moore Reservoir unit, C NE SW 3-37n-92w.

Shell shut in the discovery which is 6 miles southwest of West Lysite field and 10 miles southeast of Howard Ranch field.

Poison Creek. Humble Oil & Refining Co. will drill a second well 3 miles north of the 1 Unit discovery at 2 Unit, NE NE 17-37n-93w. It will be a 10,000-ft. Fort Union Tertiary wildcat. Last gage was 2,872 M.c.f.d. at the 1 Unit discovery in C NE NE 32-37n-93w. Perforations were at 5,418-32 ft.

Frenchie Draw. Humble is still testing at 1 Frenchie Draw unit in C NE NE 21-37n-89w, Fremont County. This wildcat flowed 4,803 M.c.f.d. and 8 bbl. condensate per day from perforations at 9,865-85 ft. No tops have been called at either Frenchie Draw or Poison Creek.

Deepest gas well in Ohio history begins testing

Testing shows of gas in Black River is under way at the deepest gas well ever sunk in Ohio.

It is on the William Marshall farm in western Guernsey County, near the Muskingum County line. Location is Section 15, Adams Township.

Lake Shore Pipe Line Co. et al. has announced that a depth of 8,602 ft. was reached. This is 571 ft. beyond the previous record, set recently by a well in Mahoning County, Ohio.

Until the logging is completed, a spokesman for the company said it will be impossible to determine whether the deep well will be a producer.

Lake Shore is a subsidiary of Consolidated Natural Gas Co.

Two wells completed in Clinton in Ohio areas

In Ohio, Hoosier Oil Co. completed 3 Melvin Ashcroft in Section 12, Fallsbury Township, Licking County. The well was completed through Clinton sand at a total depth of 3,046 ft. A solid pay section with no break of 34 ft. of sand was found. After return of all fracture oil, the well made 200 bbl. the first 24 hours flowing.

Hoosier also completed 1-A Walter Leonard in Section 1, Falls Township, Hocking County. Total depth was 2,679 ft. The Clinton sand had a 30-ft. pay and was fractured. This well made 76 bbl. of oil the first 24 hours after return of all fracture oil.

Clinton gas hit at Richland well in Ohio

In Ohio, C. E. Ringler hit natural production of 5 M.M.c.f.d. on completion of 2 Ira George, Section 30, in southwest Worthington Township, Richland County.

The Clinton sand was topped at 2,546 ft. and drilled in to 2,555 ft. Rock pressure gas was 1,330 psi. in 24 hours.

• An eastward extension of more than ½ mile to Newburg production in Canaan Township, Wayne County was announced by Arrow Oil & Gas Co. The 1 Chas. Keltz, Section 16, had 3 bbl. oil per day natural in the pay at 3,038-52 ft. that tested 110 bbl. oil per day with 197 M.c.f.d. after fracture.

Deep Knox wildcat quits in East Kentucky

After extensive testing, United Fuel Gas Co. has abandoned its deep key wildcat test 1 Ada Pennington. The well is located in 21-T-70, 1,750 ft. from east line and 5,325 ft. from south line in Elliott County.

No details have been released but well was reported to have bottomed at 3,950 ft. in the Knox dolomite formation of Cambro-Ordovician age.

Triple gas completion reported in Arkansas

The Arkansas portion of the Arkoma basin has a triple gas producer on the northwest side of Ozark field in Franklin County. Triple well is Mull Drilling Co., Inc. 1 Doyel, NW SE 29-10n-26w.

The well flowed 22 M.M.c.f.d. from Cecil, Henson, and Brentwood sands at 2,912-24, 2,926-30, 2,932-36, 2,942-52 ft.; 2,966-69, 3,235-41, 3,320-38, 3,408-10, 3,452-64, 3,514-20, and 3,523-30 ft.; 3,839-43, 3,910-14, 4,079-83, and 4,169-85 ft. This is the first triple well in the field. Mull has two other wells in the field, both dual completions in Cecil and Kelly and Cecil and Brentwood Pennsylvanian sands.

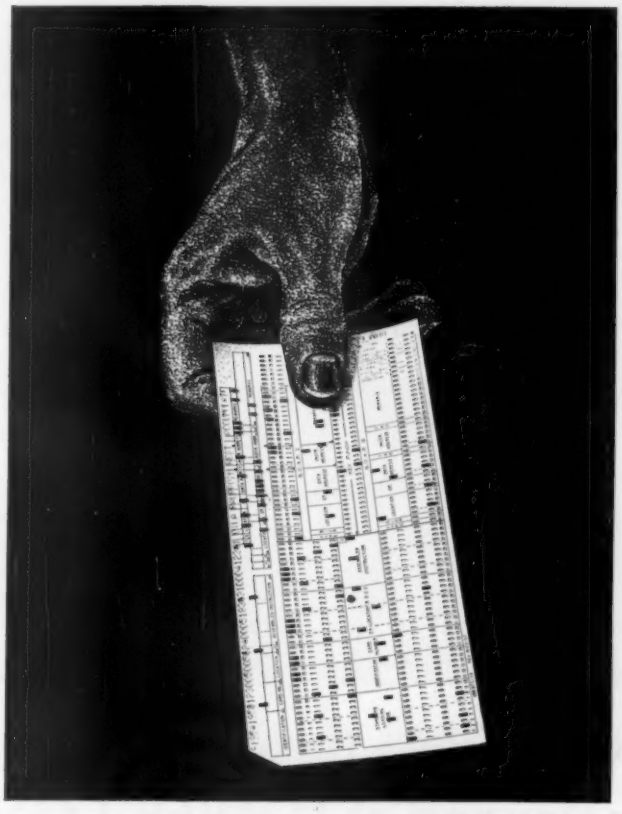
East Texas field taps Rodessa pay

RODESSA oil production is reported at a Fairway field well in northern Anderson County, East Texas. Discovery well is Texaco Inc. 1 K. R. Mitchell in the Jose Cherino Survey, A-168.

Flow was 159 bbl. of 45.2°-gravity oil, 8% b.s. and w. through 13/64-in. choke from perforations at 9,568-76 and 9,582-93 ft. This is the first triple completion in Fairway field. The well made 201 bbl. of 45.4°-gravity oil per day through 18/64-in. choke from Massive anhydrite perforations at 9,368-85 ft. and 345 bbl. of 46.4°-gravity oil per day through 13/64-in. choke from James lime perforations at 9,926-45 ft.

Smackover wildcat. Amerada Petroleum Corp. will drill an 11,800-ft. Smackover test in Cass County at 1 Annie Hancock in the Joseph Wood Survey, A-1073, 1¼ miles northeast of Marietta and 4 miles southwest of Bryans Mill Smackover field and 2½ miles southwest of an indicated Smackover find.

The nearest previous Smackover test is Mobil Oil Co. 1 Bradham Gas unit in the Samuel F. Moore Survey, A-690, 2 miles southwest of Bryans Mill field. That hole is bottomed at 10,786 ft. and cased to that point. The operator is waiting on special tubing, expected June 15, before perforating Smackover. A drill-stem test at 10,587-10,664



this well is misbehaving

One of the most significant and directly useful "products" of Core Lab's new *CAP* service — COMPUTERIZED ACCOUNTING OF PRODUCTION — is the reporting of abnormal well behavior.

Not only does *CAP* deliver complete, tailormade production summaries (by zones, wells, batteries, leases, fields, and interests) but special reports can be issued when variations occur in well test, production, or injection characteristics. The client specifies the tolerances when his program is designed. *CAP* takes it from there. It's quick and simple, accurate and economical.

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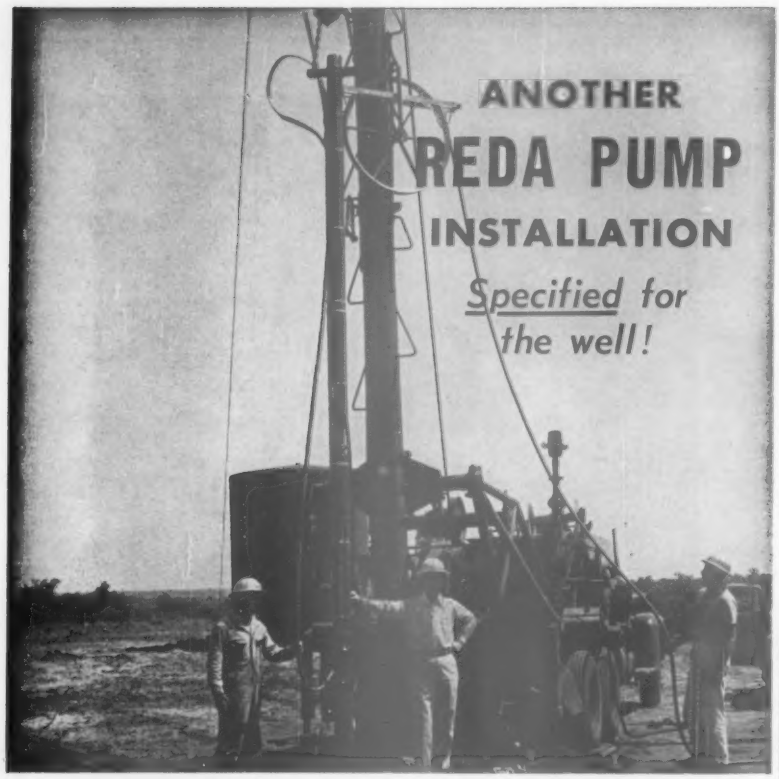

REDA Does the Job Better and at LOWER COST

Billions of barrels of fluid (oil and water) have been produced at an average lifting cost of less than one cent per barrel for each 1,000 foot lift. Chart "A" illustrates average lifting cost from 600 B/D to 6,000 B/D using Reda Submergible Pumps.

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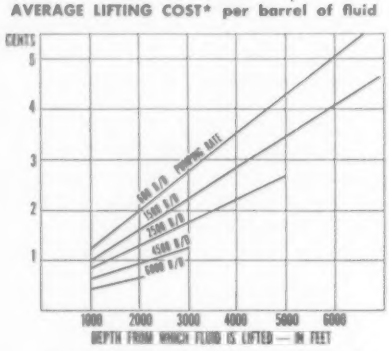

*Included: Electric Energy (10 Mills Per KWH), Run and Pull, Repairs, Upkeep, Transportation, Labor and Amortization (5 Yrs.)

Chart "A"

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ft. through open hole got 2,700 ft. of gas and 140 ft. of gas-cut mud.

Waskom field. Javelin Oil Co. completed a new pay in Waskom field, northeastern Panola County, at 1 Alexander unit, Jane Tharp Survey, 3½ miles west of Bethany. The well flowed 245 bbl. of 38.6°-gravity oil daily through ¼-in. choke from perforations in the Travis Peak Alexander sand at 6,078-88 ft. Nearest similar production is 2 miles northeast in Waskom field, Bearden sand. The new well is also complete in Hightower sand of Travis Peak at 6,175-83 ft., flowing 3,500 M.c.f.d. with condensate ratio at 251,300:1.

Oklahoma's deepest producer is recompleted

The state's deepest producer, British-American Oil Producing Co. 1 Krieger, NE NW SW SW 3-2n-5w, Stephens County, was reworked. The well previously had production in the second and third Bromide sands at 14,805-82 and 15,034-84 ft. New flow is 12 M.M.c.f.d. from Oil Creek at 16,490-16,612 ft. Flow from the upper pays was 12,260 M.c.f.d.

Calhoun discovery flows gas in Lavaca Bay, Texas

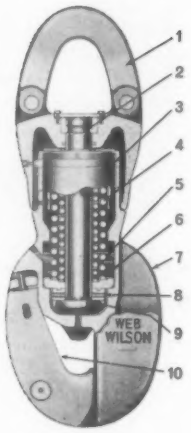
A Lavaca Bay wildcat, Continental Oil Co. 1 State Tract 4, flowed 15,500 M.c.f.d. on open-flow test. Gas was accompanied by condensate at the rate of 32,660:1. The well went to 8,711 ft. Location is in the northeast corner of State Tract 4, 2 miles east of Port Lavaca. Perforations were at 7,456-66 ft. and 7,473-79 ft.

Big gasser reported in Orange County, Texas

A prolific gas-consendate discovery was completed 3 miles southwest of Hartburg in South Texas. Discovery well is Texas Gulf Producing Co. 2 Claybar-Lindsey.

The well flowed 360 M.M.c.f..d. absolute open flow, from Morgan "B" sand perforations at 7,811-17 ft. Flow of condensate was 132 bbl. per day. Location is off the northeast flank of the South Hartburg field in the Eugene Wood GC&SF Survey 10, A-477. Name for the field will be Cla-Lin.

"Matched Tools for Unmatched Performance"



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Every time a joint is made up or broken out, you benefit from the simple, foolproof shock absorbing hydraulic action of the Web Wilson Hydra Hook that prevents damage to threads and shoulders. Another distinct advantage—Hydra Hook is the shortest on the market—the least expensive way to add feet and inches of working height.

Economical operation and simple servicing are assured by these features: (1) Can be unitized or direct connected to all leading traveling blocks • (2) No load carrying threads—solid shank carries load • (3) 8 locked positions (12 in 450 ton) prevent rotation • (4) Less than 10 working parts • (5) Transported without draining oil • (6) Major internal parts enclosed in oil bath • (7) Parts are magnaflux inspected • (8) Large, staggered roller bearing, in oil bath for free swiveling • (9) No seals in hydraulic reservoir to leak • (10) Latch *cannot* open with load applied.

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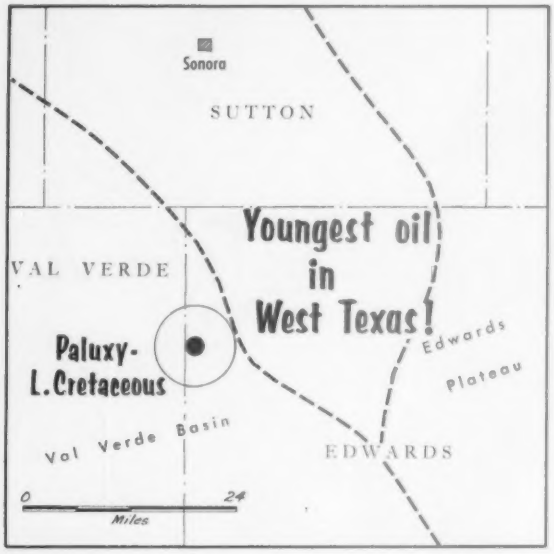

YOUNGEST oil production in West Texas is reported at a small producer in Edwards County.

Shallow Texas test taps oil

PALUXY Lower Cretaceous oil production is reported at a remote wildcat in western Edwards County on the east rim of Val Verde basin. Though small in potential, the well is of interest due to its pay zone.

Discovery well is Hank Avery 1 Wardlaw Brothers et al., a cable-tool test 42 miles south of Sonora, ½ mile east of depleted Paluxy production. The well was completed on a pump for 5 bbl. of oil per day from open hole in the Paluxy at 283 ft. Total depth is 320 ft.

The Paluxy, part of the Comanchean series of Lower Cretaceous rocks, produces in East Texas and the Ark.-La.-Tex. region, but is unknown this far west in Texas. Surface rocks in the region are Comanchean Edwards. There is some small Trinity oil in Pecos County, and some Triassic or pre-Cretaceous production in Yates field. The Paluxy did produce in the Edwards County area at one time. Avery's discovery revives Lower Cretaceous oil in its shallowest form.

Deep Texas test slated by Shell near Edwards well

Location is announced for a 16,000-ft. test in the Pawnee area of South Texas' Bee County. The Shell Oil Co. well will be the 1 Freddie Tomasek et al., 3 miles southeast of the town of Pawnee, Tex., on the BS&F Survey, A-126, Section 25, Theodore Plummer Subdivision of Lott Lands.

The well is about ¾ mile east of the 1 Alvin O'Neal discovery. That well flowed 2,368 M.c.f.d. plus 5 bbl. water per hour through ½-in. choke from Edwards lime perforations at 13,919-30 ft.

Bee County. Humble Oil & Refining Co. 3 Laura T. Barrow, wildcat 7 miles northeast of Papalote in southeastern Bee County, flowed 139 bbl. of oil daily through 3/16-in. choke from perforations at 5,581-84 ft. Location is in the Pat Downey Survey, A-20. It lies 5,600 ft. north of the No. 2 discovery, a well completed for gas at 5,634-38 ft.

Runnels County. In West Central Texas, Karl Hoblitzelle opened upper Canyon Pennsylvanian sand production at 1-F Herring, 6 miles southeast of Norton and 1 mile east of Motley Canyon field.

The well flowed 289 bbl. of oil per day from perforations at 3,275-79 ft. through 14/64-in. choke. Location is in Section 34, H&GN Survey.

Pool Creek is new Rodessa discovery in Mississippi

Pool Creek's discovery well, E. L. Erickson 1 Weems et al., N. NE 22-9n-10w, Jones County, was officially completed. From Rodessa at 10,704-16 ft. the well flowed at the rate of 528 bbl. per day through ¼-in. choke on a 6-hour test. From Sligo perforations at 11,221-24 and 11,227-35 ft. on a 5-hour test, the well flowed 576 bbl. per day through ¼-in. choke.

Later tests through 12/64-in. choke got 191 bbl. per day from Rodessa and 214 bbl. per day from Sligo. The south offset to the new field-opener is drilling at 9,844 ft. Permit has been issued for an east offset, both wells being drilled by Placid Oil Co.

Two names suggested for new Texas discovery

Progreso or Llano Grande are field names suggested for a new Frio gas-condensate discovery in Hidalgo County, 2 miles northeast of Progreso in South Texas.

Plymouth Oil Co. 1 D. J. Schwarz flowed 5,200 M.c.f.d. from lower Frio perforations at 8,548-54 ft. Gas-liquid ratio is 488,000:1. Location is in Share 5, Llano Grande Grant, 2 miles west of Santa Maria field.

New oil find completed in Iberville Parish, Louisiana

State gage is reported at a new oil discovery in South Louisiana. It is Olin Oil & Gas Co. 1 Joseph Lorio Estate, 3½ miles southeast of West Rosedale field in Iberville Parish.

The well flowed 369 bbl. of oil per day. Location is in Section 14-8s-9e.

Allowable asked for triple North Texas discovery well

Allowable was requested for a new Conglomerate field discovery well in Throckmorton County, North Texas. Discovery well is Humble Oil & Refining Co. 2 S. D. Liles, Sr., 6½ miles northeast of Throckmorton in Troy conglomerate field.

The well flowed 45 bbl. of oil per day on 16/64-in. choke from

Reed Cobra bits are just one example of the outstanding economies made possible by Reed's continuing program of research and development. These bits are setting phenomenal records all over the oil country in both mud and air drilling. For example—

On a West Texas well, drilling with mud below 12,000 feet, four Reed Cobra bits drilled 2,289 feet in 404½ hours. On an offset well it took 37 tooth bits to drill 2,172 feet in 558 hours. On another West Texas well a Cobra bit set an air drilling record of 3,644 feet in 103 hours.

In Pennsylvania, drilling with air, it is routine for one Reed Cobra bit to complete the hole from surface casing to TD. In this area total footage per Cobra bit regularly exceeds 7,000 feet.

Drilling with mud in East Texas in the tough Travis Peak formation Cobra bits consistently get runs up to 250 feet. Drilling with gas in Mississippi 10 Cobra bits drilled 6,850 feet in 358½ hours. In the same vicinity more than 10 times this number of tooth bits were required to drill the same footage with mud.

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PENNSYLVANIA — 1 COBRA BIT, 8,352 FEET IN 134½ HOURS

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Better Production Tools Through Research

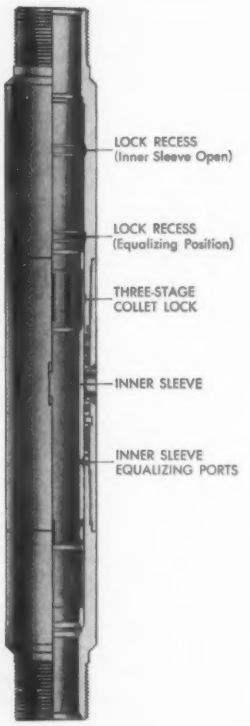
OTIS Equipment NEWS

Volume III, Number 1 **Otis Engineering Corporation • Dallas** *Production Equipment and Services*

Otis Sliding Side-Door Proves Most Versatile Circulating and Production Tool in the Field Today

Three Different Versions Solve Many Costly Production Problems

DALLAS — The Type A Otis Sliding Side-Door®, designed and introduced to the oil industry just four years ago, has become the most widely used selective circulating and production tool in the field today. Since its introduction, two modified versions — the Sliding Side-Door, with pump-out plugs and expendable shifting device, and the Sliding Side-Door Cross-Over — have been introduced.



TYPE A OTIS
SLIDING SIDE DOOR

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The Type A Otis Sliding Side-Door is a full-opening tool designed to provide a selective means of establishing a flow course between the tubing and annulus without killing the well, moving the tubing or disturbing the packer setting. The tool is so designed as to permit any number of Sliding Side-Doors to be installed in a single string of tubing and any one or all opened or closed by wire line methods using a standard Otis Shifting Tool. When desired, the Type A Sliding Side-Door may be equipped with a special expendable shifting device and run into the well on the tubing in the opened position. This expendable shifting device serves to catch an aluminum ball or drop plug which is pumped down after circulating to close the sleeve.

Proven Design Features

According to the many operators using this equipment, there is an exclusive combination of features that makes the Otis Sliding Side-Door preferable for efficient well completion and economical production. These are: (1) Thoroughly proven in hundreds of wells. The design and mechanical operation of the tool has several years of operating proof behind it — the producer can use the Otis Sliding Side-Door with confidence. (2) Provisions for a positive indication that the sleeve is fully shifted. The standard Otis Wire Line Shifting Tool used to shift the sleeve of the Sliding Side-Door is designed to release itself only after the sleeve has been shifted to its fully opened or fully closed position. Equalizing ports in the sleeve serve to permit equalization of abnormal pressure differential while shifting the sleeve. (3) Outer sleeve design and construction combined with the clearance between the inner and outer sleeves serve to eliminate the metal-to-metal bind that makes shifting other tools often impossible. The Type A Otis Sliding Side-Door is designed to withstand the distorting forces of temperature, compression, tension or torque and still be shifted. (4) The flow area of the ports in the sleeve has proved ample for most applications.

Versions for Special Application

A Type A Otis Sliding Side-Door with pump out plugs and an expendable shifting device is also available which has been designed to cut completion costs and provide additional blow-out protection in that it serves to permit high differential drillable packers to be tested and the tree nippled up before unloading the well.

Another version is the Otis Sliding Side-Door Cross-Over which is designed to provide for complete zone isolation while changing or removing cross-over chokes in single-string, dual completions.

All three Otis Sliding Side-Doors are available in a wide range of sizes — and all three Sliding Side-Doors are good examples of the cooperation of Otis' Well Completion Specialists and Engineering Staff in assisting operators to meet today's demand for economical well completion and production tools. Literally thousands of production problems have been solved by Otis over the past thirty years. Perhaps you are faced with a production problem Otis could help solve. If so, call your local Otis specialist today. For more information on Otis Sliding Side-Door equipment, call the Otis office nearest you or write Otis, Dept. E-1, P. O. Box 35206, Dallas 35, Texas. You'll find experienced Otis Well Completion Specialists ready to help you . . . anxious to serve you . . . and with the widest variety of field proven production equipment and services available today.

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lower Conglomerate perforations at 4,707-18 ft. From lower Caddo perforations at 4,562-66 and 4,579-86 ft. the well flowed 125 bbl. in 23 hours through 12/64-in. choke. From Mississippian lime perforations at 4,758-4,816 ft. through 12/64-in. choke, the well flowed 161 bbl. of oil in 21 hours. Nearest lower Conglomerate production is 7,000 ft. southwest. Nearest lower Caddo production is 6,500 ft. southeast. The well is located in Section 3022, TE&L Survey.

West Texas' Warfield area gains a triple producer

Ellenburger and Fusselman are new pays in Warfield field, western Midland County, West Texas. Texaco Inc. 1 B. F. McKandles, recently completed in the above pays, was completed in the Devonian, becoming second Devonian producer for the field.

The well flowed 75 bbl. per day on 24/64-in. choke plus 22 bbl. water from Devonian perforations at 11,926-78 ft. From Ellenburger at 13,092-13,107 ft. it flowed 502 bbl. per day on 18/64-in. choke. From Fusselman at 12,564-84 ft. it flowed 113 bbl. per day through ¾-in. choke. Location is in Section 30, Block 40, T-2-S, T&P Survey, ½ mile east of Strawn production, ½ mile southwest of Devonian production, and ½ mile north of Spraberry production.

Lake Erie well is gas producer

An excellent gas well is reported by Place Oil & Gas Co., Ltd., in the first drilling to be undertaken this season by the company on the southerly extension of its Walpole-Selkirk gas field, in the eastern sector of Lake Erie.

No fracturing treatment was applied to the well, which in initial production tests indicated a natural open gas flow of 2,150 M.c.f.d. with an original bottom-hole pressure measurement of 500 psi. Production is coming from an approximate 40-ft. section in the Red Medina formation at a depth of 900 ft. The production string has been set, and cementing is now under way.

Identified as Place 24 Walpole, the new well lies approximately ½ mile south and east of Place 23 Walpole and Place 21 Walpole respectively, about 4 miles out in the lake. Upon completion, the well will be hooked up to the company's gasoline-gathering system in the area. In view of the size of the natural open flow, the high bottom-hole pressure, the thickness of the pay section of this well, and the significance it holds with regard to reservoir potentials and recovery factor for the area, indications are that it is one of the most important gas wells in the eastern sector of the lake to date. The field is still open on company acreage, which extends for over 3 more miles south of the current drilling and 10 miles to the west.

With a six-well program as a target for this season's drilling in Walpole-Selkirk field, the company expects to be moving equipment within the next few days onto location of its next well, Place 15 Walpole, southward of Peacock Point.

Discovery wells

CALIFORNIA

Kern County:
Signal Oil & Gas Co. 1-16X Signal unit, SW NW SW 20-30s-28e. Completed flowing 61 bbl. daily of 29.6° gravity crude through 12/64-in. choke with 0.2% water cut. Flow from Miocene sand between 10,514-95 ft. TD 10,928 ft. Discovery well in Kernsumner field.

San Joaquin County:
John M. Young, 1 Young unit, 850 ft. south and 1,320 ft. west from NE corner of 29-3s-6e. Flowed 1,250 M.c.f.d. through ¼-in. choke from selected intervals between 4,234-65 ft. with shut-in pressure of 1,500 psi. TD 5,225. New pool discovery in Upper Cretaceous sand. Test located 1½ miles southwest of Vernalis gas field.

WESTERN CANADA

Alberta:
Pure-TPC&O-Baysel 10-28 Ferrier, LSD 10, 28-39-7w5. Cardium oil discovery. TD 9,033 ft.

Dome-Provo 10-28 Lochend, LSD 10, 28-27-3w5. Cardium oil discovery. TD 9,437 ft.

Francana 6-18 Cessford, LSD 6, 19-25-13w4. Mississippian gas discovery. TD 3,525 ft.

Northwest Territories:
Western et al. 66-7-42 Chance, 137-31-32 W. Long. Suspended Mississippian oil discovery. TD 8,648 ft.

Saskatchewan:
North Canadian 6-35 Hilda, LSD 6, 35-17-1w4. Medicine Hat gas discovery. TD 1,800 ft.

KANSAS

Butler County:
Shawver-Armour Inc. 1 Skaer, 7 miles west of Augusta in SE SE SW 21-27s-3e. IPP 25 BOPD, Simpson open hole 3,037-42 ft. TD 3,042 ft. New oil discovery.

Ellis County:
Mack Oil Co. 2 Gottschalk, 4½ miles south of Ellis in NE SW NE 4-14s-20w. IPP 10 BOPD, 65% water, 37°, Arbuckle open hole 3,937-45 ft. TD 3,945 ft. New oil discovery.

Finney County:
Cities Service Petroleum Co. 1 Cowgill "A," 2 miles southwest of Garden City in C NW SE 27-24s-33w. IPP 120 BOPD, Morrow 4,815-26 ft. TD 5,360 ft. New oil discovery.

Greenwood County:
E. Ashlock 1 Harris, 12 miles northeast of Eureka in 10-25s-12e. IPP 5 BOPD, Peru sand 1,499-57 ft. TD 1,567 ft. Opens Harris oil field.

Harvey County:
Mull Drilling Co. 1 Kaufman-Smith, 1 mile northwest of Halstead pool in C NW SW 26-22s-2w. IPF 1,700 M.c.f.d., Mississippian 2,952-67 ft. TD 3,440 ft. New gas discovery.

Ness County:
Kern Drilling Co., Inc. 1 Burgess, 12 miles northwest of Ness City in NE SE SE 29-16s-25w. IPP 123 BOPD, 0.2% water, 40°, Miss. Warsaw dolomite 4,464-72 ft. TD 4,487 ft. New oil discovery.

ILLINOIS

Shelby County:
J. P. Potsch 1 Charles and Rose Weder, NE NW NW 28-12n-2e. IPP 8 BOPD, 12 BWPD, Benoist 1,508-12 ft. TD 1,516 ft. Opens Dollville pool.

KENTUCKY

Muhlenburg County:
Fred Rowe 1 Dennis Baker, 7-H-31. IPP 7 BOPD, 14 BWPD, Jackson 1,018-32 ft. TD 1,090 ft. Opens North Penrod pool.

SOUTH LOUISIANA

Plaquemines Parish:
Gulf Oil Corp. C-1 Mark Delesdernier, 5-23s-31e. IPF 208 BOPD, 9/64-in. choke, 8,651-54 ft. 37.5°, GOR 937:1. 195 M.c.f.d. TD 10,416 ft. PBTD 9,048 ft. New oil discovery.

MICHIGAN

St. Clair County:
Leonard Oil, Inc. 1 Brown, NE SE SW 24-5n-15e. AIP 35 BOPD. El 652, Niagaran 2,892 ft., TD 2,962 ft. New oil pool.

NEBRASKA

Kimball County:
Tom Vessels Jr. 1 Hanson, C SW SW 29-14n-54w. IPP 63 BOPD, "J" sand 6,127 ft. TD 6,180 ft. "J" sand discovery, new Denver basin field.

NEW MEXICO

Eddy County:
Gulf Oil Corp. 2-D State, 6 miles northeast of Carlsbad in 25-19s-28e. IPP 14 BOPD plus 86 BWPD, 34.1°, GOR 1,214:1, 1,983-85 ft. TD 2,100 ft. New oil discovery.

SOUTH TEXAS

Calhoun County:
Continental Oil Co. 1 St. Tr. 4, 2 miles east of Port Lavaca in St. Tr. 4, Lavaca Bay. IPAOF 15,500 M.c.f.d., SITP 2,744 psi., GLR 32,660:1, BHPSI 3,383 psi. 7,456-66 and 7,473-79 ft. TD 8,711 ft. New gas-condensate discovery.

DeWitt County:
Standard Oil Co. of Texas 1 Louis Trautwein et al., 3 miles west of Arneckeville in Chas. Erambeet Sur., A-172. IPAOF 8,400 M.c.f.d., SITP 2,529 psi., 61°, GLR 26,440:1, BHPSI 3,215 psi., upper Wilcox 7,640-45 ft. TD 13,726 ft. New gas-condensate discovery.

WEST TEXAS

Borden County:

Gordon-Simpson field. General American Oil Co. of Texas 3 Miller, 8 miles southwest of Justiceburg in Sec. 64, Blk. 6, H&GN Sur. IPP 168 BOPD, 15% water, 40.1°, GOR 460:1, Strawn 7,810-17 and 7,849-58 ft. IPP 112 BOPD, 40.5°, GOR 425:1, Spraberry 4,837-66 ft. TD 8,292 ft. Dual oil discovery.

Crockett County:

El Cinco Production Co. 2 C. B. Johns, 6 miles southwest of McCamey in Sec. 24, Blk. 31, H&TC Sur. IPF 223 BOPD, 31/64-in. choke, 42°, GOR 750:1, TP 50 psi., packer. Devonian 5,218-72 ft. TD 5,590 ft. New oil discovery.

Plymouth Oil Co. 13 Noelke Livestock Co. "00," 16 miles southeast of Iraan, Sec. 10, Blk. GG, T&N Sur. IPAOF 265 M.c.f.d. Seven Rivers 1,358-64 ft. TD 1,764 ft. New gas discovery.

Cosden Petroleum Corp. 1 Roy Miller, 8 miles southwest of Ozona in Sec. 2, Blk. O, TCRR Sur. IPP 98 BOPD, 36°, GOR 980:1, Permian 3,282-90, 3,296-3,303, and 3,307-12 ft. TD 9,000 ft. New oil discovery.

Gaines County:

Texaco Inc. 1 N. B. Birge, 14 miles east of Seminole in Sec. 1, Blk. C-43, PSL Sur. IPF 590 BOPD, 16/64-in. choke, 42.4°, GOR 150:1, TP 1,200 psi., packer, Strawn 11,069-80 ft. TD 12,890 ft. New oil discovery.

Hockley County:

Jake L. Hamon and Champlin Oil & Refining Co. 1 Spade Farms Inc., 9 miles southwest of Anton in Sec. 45, Blk. A, R. M. Thompson Sur. IPF 302 BOPD, 14/64-in. choke, 41°, GOR 446:1. TP 550 psi., packer. Strawn 10,016-22 ft. TD 10,038 ft. New oil discovery.

Upton County:

Jack Herbert field. Gulf Oil Corp. 9-L McElroy Ranch Co., 13 miles east of Crane in Sec. 109, Blk. D, CCSD&RGNG Sur. IPF 112 BOPD, plus 15% water, 20/64-in. choke, 55.7°, GOR 4,563:1, TP 375 psi., packer, Devonian 11,044-11,248 ft.; IPCAOF 22,200 M.c.f.d., Pennsylvanian 9,740-9,830 ft. TD 11,779 ft. Dual gas-condensate discovery.

Adamc field. Gulf Oil Corp. 52-B J. T. McElroy, 4 miles east of Crane in Sec. 187, Blk. F., CCSD&RGNG Sur. IPF 431 BOPD, 16/64-in. choke, 44°, GOR 1,208:1, packer, CP 790 psi., Wolfcamp 8,046-62 ft.; IPF 540 BOPD, 20/64-in. choke, 44.2°, GOR 1,684:1, Bend 8,836-88 ft.; IPF 88 BOPD, 1-in. choke, 44.4°, GOR 3,987:1, TP 40 psi., packer. Devonian 9,984-10,443 ft. TD 10,500 ft. Triple zone oil discovery.

Geologists set Missouri meet

Historic old Hannibal, Mo., will be the rendezvous for the twenty-sixth annual Kansas Geological field conference to be held Thursday, Friday, and Saturday, September 14-16, 1961. Registration begins Thursday at the Mark Twain Hotel in Hannibal. The hotel will also serve as headquarters for the conference.

The main objective of the conference will be to study the boundary problems of the lower Mississippian section. This section is beautifully exposed along the scenic Mississippi River Valley between St. Louis and Hannibal. Director for the conference will be Dr. Thomas R. Beveridge, Missouri state geologist. He will be assisted by members of Missouri Geological Survey and the Illinois State Geological Survey who will serve as cohosts for the conference.

All field trips will be conducted in air-conditioned busses that have been especially chartered for this conference. For additional information contact Orvie L. Howell, Field Trip Chairman, Kansas Geological Society, Lario Oil & Gas Co., 301 South Market, Wichita, Kans.

Texas geologic history will be compiled

A geologic history of portions of five Central Texas counties— Gillespie, Llano, Mason, Burnet and Blanco—will be compiled by a University of Texas geologist who has received a $1,070 GSA research grant.

Dr. Robert E. Boyer will conduct statistical studies and make structural maps of the area of the Llano Uplift.

Dr. Boyer, a University faculty member since 1957, received his doctorate from the University of Michigan.

Seminar being sponsored by Pan American

The research department of Pan American Petroleum Corp. is sponsoring a 3-week seminar, June 10 through June 30, for an intensive

(Continued on Page 191)

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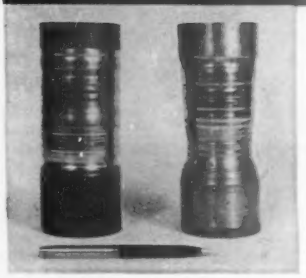

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▶▶▶ Personals

J. R. Wylie, Jr., executive vice president and a director of Hiawatha Oil & Gas Co. and Penn-Ohio Gas Co., has been elected president of both companies. He succeeds **Paul G. Benedum,** recently elected president and chief executive officer of Plymouth Oil Co. Benedum will continue as a director of both companies. **Paul G. Benedum, Jr.,** has been elected a vice president of Hiawatha and Penn-Ohio.

WYLIE

Tom Durrance has been named vice president of Arabian American Oil Co. and Trans Arabian Pipe Line Co. He succeeds **H. O. Thompson,** who will continue with the companies as a consultant. Durrance was with Texaco before joining Aramco to head their field public relations operations. Durrance will headquarter in Beirut. Thompson will be stationed in New York.

S. J. Gardner, Cody, Wyo., has been named general manager of supply and distribution for Canadian Husky Oil, Ltd., and its subsidiary, Husky Oil Co. He is responsible for purchase and sale of crude oil and for distribution of refined products from the four Husky refineries. He will continue as general traffic manager.

Ed Gornowski, assistant director of Esso Research & Engineering Co.'s petroleum-development division, has been named director. He succeeds **Wes Tyson,** who will retire at the end of year. Until retirement, Tyson will be special assistant to the vice president. **Don MacLaren,** section head in petroleum development, will succeed Gornowski as assistant director.

Robert H. Gow, president of Champlin-Zapata Plastic Machinery Inc., has been elected a director of Zapata Off-Shore Co. His election brings Zapata board membership to six.

R. Christy has been named manager of administration and services in the service-engineering department of Shell Development Co. in Houston. He succeeds **D. E. Broussard,** now on special assignment at Shell Development's head office in New York. **O. G. Holekamp** has been named manager of exploration research in the Houston geophysical department. He succeeds **Dr. F. A. Van Melle,** who has been named consultant in geophysics. **Dr. C. H. Fay,** most recently on assignment in New York as technical assistant to the president, has been named Houston consultant in physics.

George H. Jett, formerly vice president and general manager of Jett Drilling Co., Inc., has formed George H. Jett Drilling Co. with headquarters in Shreveport, La. **Kent Upson** has joined the company as land department manager.

W. P. Dick, distribution vice president of the Charleston group companies of Columbia Gas System, has been elected vice president and general manager of the Charleston group. He succeeds **James S. Phillips,** recently elected Charleston group president. The Charleston group includes United Fuel Gas Co., Amere Gas Utilities Co., Kentucky Gas Transmission Corp., Columbia Gas of Kentucky, Big Marsh Oil Co., Atlantic Seaboard Corp., and Virginia Gas Distribution Corp.

DICK

PHILLIPS

William J. Tater, chief economist in charge of the National Energy Board of Canada's economics branch, has joined Socony Mobil Oil Co. as manager of the special-studies division of the economics and special-studies department. Tater was with Tidewater Oil Co. before joining the Canadian Energy Board.

Clifford B. Marshall, executive vice president of Standard-Vacuum Oil Co. has been named president.

MARSHALL

McQUILKIN

He succeeds **H. F. Prioleau,** who has retired. **J. A. McQuilkin,** Stanvac vice president, has been named to succeed Marshall as executive vice president.

George C. Hardin, Jr., consulting geologist, has been elected president of Houston Geological Society. He succeeds **Dr. William A. Gorman,** Royal Oil & Gas Corp. Other new officers are **Benjamin T. Simmons,** consultant, first vice president; **E. H. Rainwater,** Shell Oil Co., second vice president; **Lewis J. Hubka, Jr.,** United Producing Co., secretary; and **Cecil R. Rives,** Lion Oil Co., treasurer. **W. F. Cooke, Jr.,** Anderson & Cooke, has been elected to the advisory committee.

D. M. Cox, manager of supply and distribution for Humble in Houston, has been named supply and transportation coordinator in the new headquarters supply and transportation department. Four managers in the department will be **John G. Yeager,** crude oil; **C. C. Garvin, Jr.,** products-supply and distribution; **Haylett O'Neill,** purchasing; and **N. C. Dunn,** traffic.

Frank J. Hopp has been named supervisor of Universal Oil Products Co.'s catalyst-evaluation laboratory, service laboratories department. **Esbon Y. Titus** has been promoted to associate supervisor of the department's products-acceptance and control laboratory.

Gerald Ramsey, Kewanee Oil Co., has been elected president of Tulsa Association of Petroleum Landmen. Other new officers include **R. F. Rood,** Phillips Petroleum Co., vice president; **Sidney H. Johnson,** Falcon Seaboard Drilling Co., secretary; and **Floyd T. Gates,** Sun Oil Co., treasurer.

***OFFICERS** of Kentucky Oil and Gas Association include, left to right, J. Roy Mace, Emery E. Clark, Robert A. Reilly, Robert W. Moore, and George Hoffman.*

Kentucky Association Elects Officers

Emery E. Clark of West Virginia Gas Co., Prestonburg, Ky., has been elected 1961-62 president of Kentucky Oil and Gas Association.

The association's five vice presidents include C. E. Goodwin, Union Fuel Gas Co., Charleston, W. Va.; J. Roy Mace, Petroleum Exploration, Inc., Winchester, Ky.; George A. Hoffman, Henderson, Ky., independent; John M. Capito, United Carbon Co., Charleston; and Robert W. Moore, L. L. Morris Supply Co., Glasgow, Ky.

Robert A. Reilly, Owensboro, Ky., is executive secretary of the association. Angus W. McDonald, Lexington, Ky., attorney, is secretary.

Virgil B. Harris, executive vice president and a director of Producing Properties, Inc., has been elected president of the firm. Harris succeeds the late Mac D. Oliver, Jr. In other Producing Properties changes, **Lionel E. Gilly,** financial vice president and secretary, has been named senior vice president. **Sidney H. Gottlieb, Kenneth C. English,** and **H. Eugene Wright** have been elected vice presidents.

Wallace S. Johnston, superintendent in Crane, Tex., for Cities Service Oil Co., has been named production foreman for Cities Service Petroleum Co. in Russell, Kans.

Don R. Moore, supervising engineer in charge of the fuels-specialties section at Humble's Baytown, Tex., refinery, has been named planning coordinator in Houston headquarters planning management.

George H. Rabson, chief reservoir engineer in Transcontinental Gas Pipe Line Corp.'s gas-supply department, has been promoted to chief geological engineer. **Edward R. Phillips,** senior production engineer in gas supply, has been promoted to chief production engineer. **W. H. Schultz,** Transco measurement engineer in Corpus Christi has been promoted to measurement supervisor there. He succeeds **J. M. Hamilton,** who has been transferred to Houston.

Ivan C. Wood, pipeline maintenance foreman for Service Pipe Line Co. in Nowata, Okla., has been transferred to Mexia, Tex., in the same capacity.

Virgil E. Myers, assistant plant superintendent at Panhandle Eastern Pipe Line Co.'s Sunray, Tex., compressor station, has been transferred to Haven, Kans., as assistant plant superintendent at the compressor station there. He succeeds **Cloyce Spradling,** who recently was promoted to plant superintendent of the Hugoton, Kans., compressor station.

B. J. Lofton, compressor station engineer for United Gas Pipe Line Co., has been transferred from the Lafayette, La., station to the Koran station in the Shreveport, La., district. **Albert A. Foreman** has been transferred from Lafayette to Agua Dulce, Tex., as compressor station engineer. **J. T. Neal,** engineer in Refugio, Tex., has been promoted to first engineer at the Koran station. **Hugh Estell,** Koran, has moved to the Carthage, Tex., station as first engineer. **C. J. Cook,** Koran, has been transferred to the Needville, Tex., compressor station as engineer.

William T. Turner, Jr., senior research engineer in Texas Gas Transmission Corp.'s planning and research department, has been named director of planning for the company. **Paul A. Fedde,** senior research engineer in planning and research, has been named director of research.

H. C. (Camp) Harris, Jr., former manager of Atlantic Refining Co.'s Mid-Continent region, has been named assistant vice president of producing. **Alan D. Knox,** land group manager in the Mid-Continent region, has been named administrative assistant to the vice president of producing.

Donald E. Hyer, Houston, has been promoted to staff geologist in Texaco's New York office, on the staff of **A. W. Baucum,** vice president. Hyer has been with Texaco since 1951 and had been on the staff of the general manager in Houston since 1959.

David A. McCaulay has been named a senior research associate in American Oil Co.'s Whiting, Ind., research and development department. He has been with American since 1944.

Gerard E. Little, shift foreman for Century Refining Co. in Garden City, Kans., has joined M. W. Kellogg Co. in New York as start-up operator.

Reorganization of Atlantic Refining Co.'s domestic producing department has resulted in many appointments at the district level. In the New Mexico district, **Gene Douglas** has been named district geologist. **Roland Champion** is district land man; **Bill Eastes,** district geophysicist; **Douglas Kloxin,** drilling and production superintendent; and **Philip Tomlinson,** district engineer. **Boone Macaulay** is manager of the New Mexico district. In the East Texas district, these appointments have been made: **Gordon Lepley,** drilling and production superintendent; **Jess Johnson,** district engineer; **Frank Castleberry,** district explorationist; **Jack Biard,** district land man; **Bruce Fox,** district geologist; **D. B. Davidson,** district geophysicist; and **Jimmie Cox,** administrative supervisor. **Ross E. Williams** is East Texas district manager. In the South Louisiana district **Barrett E. Booth** has been named drilling and production superintendent; **James G. Bradshaw,** district engineer; and **Bruce Choate,** district explorationist. **W. F. Kieschnick, Jr.,** is South Louisiana district manager.

Charles H. Culnane, Jr., has been named assistant operating superintendent in charge of SunOlin Chemical Co.'s ethylene and ethyleneoxide plants now under construction in Claymont, Del. Culnane was with Wyandotte Chemicals Corp. and Texaco before joining SunOlin.

Dr. Peter B. Lederman has been named engineer, petrochemicals, at Humble's Esso Research Laboratories, Baton Rouge, La.

Dr. John M. S. Jarvie has joined Gulf Research & Development Co.'s radiation-chemistry section in Pittsburgh.

Porter LaRoy Versfelt, Jr., has joined Marr Co., Dallas producing firm, as geologist. Versfelt had been geologist with Chatas Engineering, Tulsa consulting firm, since 1959.

John G. Champion has resigned as district geologist for Humble in Tyler, Tex., to open offices as geological consultant there. He had been with Humble 14 years.

L. A. Smith, assistant coordinator of producing activities for Standard Oil Co. (N. J.), has been named deputy coordinator of producing activities. He succeeds **Zeb Mayhew,** recently named executive vice president of International Petroleum Co. **W. J. Barnett,** producing adviser for Europe, Mediterranean and West Africa, will succeed Smith. **J. F. Moore, Jr.,** assistant producing adviser, will succeed Barnett.

W. A. Morgan has been promoted to research specialist in Humble's research and development division, Baytown, Tex.

Orin E. Rosenbaum, geologist with Humble, has been transferred to Pittsburgh from Durango, Colo.

Paul R. Rupert *has been transferred by* Tenneco Oil Co. from Lafayette, La., to Oklahoma City, where he will be petroleum engineer.

Robert J. Shafer, Jackson, Miss., has been named geophysicist for Pan American Petroleum in Oklahoma City.

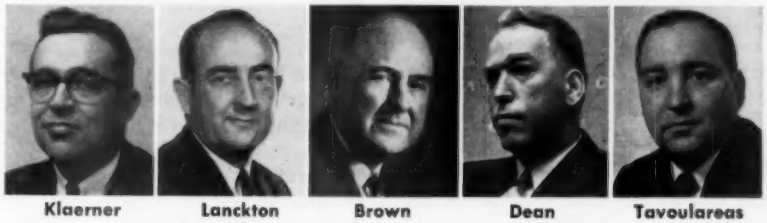
▶▶▶ Personals

Otto Hackel, Roy W. Turner, and **William W. Whitley** have left Intex Oil Co. to form Hackel & Associates, new Bakersfield, Calif., consulting firm. Hackel was manager of exploration for Intex. Turner and Whitley were district geologists. Also associated with the new company will be **Brodrick F. Dunlap,** contract land man; **James L. O'Neill,** former chief geologist for Oceanic Oil Co.; and **F. R. Rosenlieb,** formerly with Intex.

C. L. Graves, vice president of J. Ray McDermott & Co. in New Orleans, has been elected a director of the company.

Jerry Morris, *geologist with Cities* Service Petroleum, has been transferred to Owensboro, Ky., from Albuquerque.

Dr. 'Abd al-Hadi Hasan Tahir has been named director general of Saudi Arabia's Ministry of Petroleum and Mineral Resources.



Klaerner Lanckton Brown Dean Tavoulareas

Mobil Realigns Foreign Operations

MOBIL International Oil Co. has split its operations into four regions rather than three.

The new regions will be inner Europe, northern and southeastern Europe, Latin America and the Caribbean, and the Mediterranean and West Africa.

Curtis M. Klaerner has been named regional vice president for inner Europe, which includes Austria, Belgium, France, West Germany, Italy, Luxembourg, Netherlands, and Switzerland.

Arthur L. Lanckton is regional vice president for northern and southeastern Europe. This region includes United Kingdom, Denmark, Norway, Sweden, Finland, Greece, Turkey, and Cyprus.

Earl A. Brown has been named regional vice president for Latin America and the Caribbean area.

John C. Dean is regional vice president for Mediterranean and West Africa region, which includes Portugal, Spain, North and West Africa, and non-concessionary operations in the Middle East.

The four regional vice presidents will report to Rawleigh Warner, Jr., executive vice president for operations.

Robert Siegel, also executive vice president will continue to hold responsibility for Middle East concessionary interests.

William P. Tavoulareas has been named to a new position, vice president for plans and programs. He will direct planning, supply and distribution, international sales, and product planning for Mobil International.

Personals

M. L. Robinson has been named acting exploration manager in Shell Oil Co.'s Roswell, N. M., exploration and production division. Robinson, who recently completed a New York assignment, succeeds **R. L. Fay,** who has been given a New York-The Hague assignment. **W. A. Harthorn** has been named to succeed **R. L. Elkins** as division mechanical engineer in production at Roswell. Elkins also has been given a New York-The Hague assignment.

Marcelo Carlos Galar has been named director general of Yacimientos Petroliferos Fiscales, Argentine state oil agency. Galar, former manager of YPF's refinery in Buenos Aires Province, replaces **Emilio J. Diaz,** who has held the post in an acting capacity since resignation of **Dr. Arthuro Sabato.** Sabato is now assistant to the fuel and power minister. Diaz will continue as director of YPF's navigation section.

Thomas S. Gates, chairman of the executive committee of Morgan Guaranty Trust Co. of New York and former U. S. secretary of defense, has been elected a director of Cities Service Co.

Laurence D. Lindemuth has been named plant chemist at Continental Oil Co.'s Lake Charles, La., plant.

J. F. Reed, district production superintendent in Midland, Tex., for Lion Oil division of Monsanto Chemical Co., has been named superintendent of production for the southern production region, which has been reorganized. **W. S. Haun** has been named superintendent of drilling for the region. **T. F. Davis** will continue as regional production superintendent with supervision of drilling and production, and **J. G. Ragsdale** will continue as regional petroleum engineer. **J. E. Catlin,** chief production engineer in the production and exploration headquarters in Houston, has been named assistant superintendent of production with an office in the Shuler field near El Dorado, Ark. **J. W. Jean,** Arkansas production district petroleum engineer, has been transferred to the Shreveport, La., regional office as petroleum engineer.

Frederick G. Kadel has been named marketing manager for Humble's Esso Standard region. He succeeds **Guy V. Mallonee,** who recently was transferred to the Houston headquarters marketing department.

John W. Borror has joined Tobe G. Krandel Associates, Houston consulting petroleum engineers. Borror formerly was with Ohio Oil Co. and Herb J. Hawthorne Inc. in Houston.

Dr. Henry J. Schaetti, section head in Jersey Production Research Co.'s geological-research division, has been named chief geologist for Esso (Sahara), Standard Oil Co. (N. J.) exploration company operating in Algeria. Schaetti recently completed a special assignment in Buenos Aires with Esso (Argentina). His new appointment is effective July 1.

C. E. Wright, president of Pennant Drilling Co., Ltd., and **F. M. Stevenson,** vice president, have bought controlling interest in the company from Canadian Homestead Oils. Name of the company has been changed to Pennant Drilling, Ltd. Other officers include **Dale M. Simmons,** vice president in charge of operations; **Victor Buhr,** field superintendent, and **John Beals,** secretary-treasurer.

George H. Watkins has been named assistant to the vice president, chemicals, for Standard Oil Co. (Ohio).

F. F. Farley, chief research chemist at Shell Oil Co.'s Martinez, Calif., research laboratory, has been named research director there.

Deaths

John P. Washburn, Evansville, Ind., independent operator, died June 7 in a Louisville, Ky., hospital after a long illness.

E. Stanley Brown, 60, general manager of product development and process engineering for California Texas Oil Corp., died June 11 in Bronxville, N. Y., after a long illness.

Arnold J. Westfall, 63, district engineer for Shell Oil Co. in Portland, Ore., died May 28 in a Portland hospital.

Frederick Marshall Keller, 61, retired Los Angeles oil man, died June 6 of an apparent heart attack suffered while playing golf in Los Angeles. Keller was president and chairman of Oceanic Oil Co. at one time. After Oceanic's merger with Producing Properties, Inc., he continued to serve as a consultant to the combined company. Keller was a former director of Western Oil and Gas Association.

Dr. William S. W. Kew, 70, retired chief geologist for Standard Oil Co. of California, died June 4 in a San Francisco hospital after a long illness. Kew joined California Standard in 1925. He became chief geologist in 1944 and retired in 1951.

Henry F. Sartwelle, 71, retired head of Shell Oil Co.'s land department in southwestern Texas, died June 8 at his home in San Antonio.

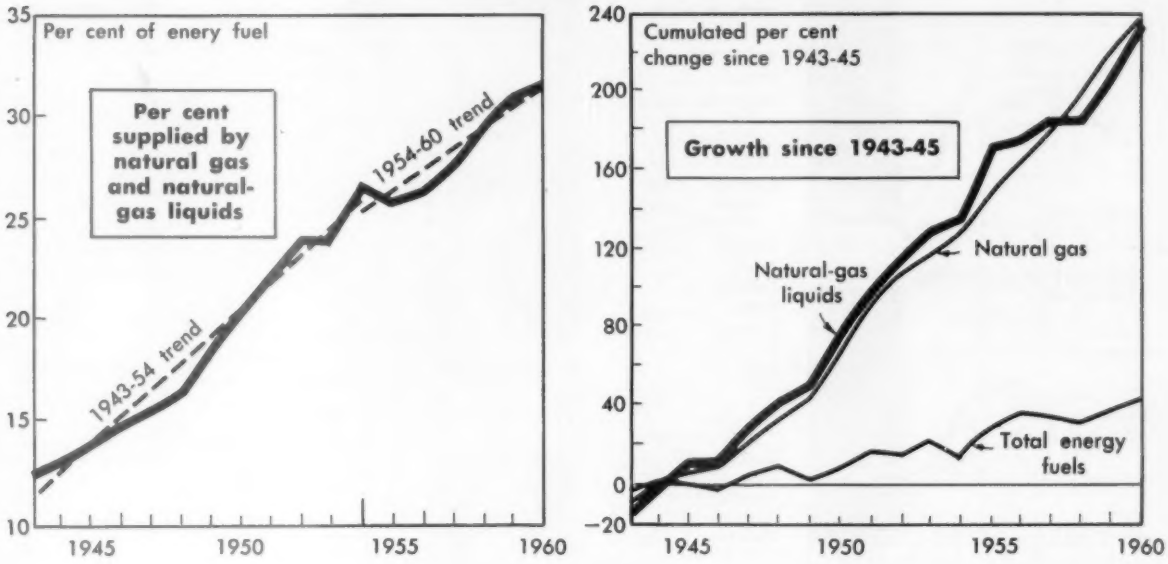
Carl F. Madsen, 61, engineer with Union Oil Co. of California, died June 7 in Los Angeles.

Edwin David Taylor, 87, retired owner of E. D. Taylor Co., oil equipment firm, died June 4 in Los Angeles.

John Raymond Deboben, 58, head of the land department and assistant to the vice president of North Central Oil Corp., died June 9 in Houston after a heart attack. He had been with North Central Oil for 37 years.

John L. Dimit, 79, retired Gulf Oil Corp. district superintendent, died June 13 in a Sapulpa, Okla., hospital after a long illness. Dimit retired in 1947 after 42 years with Gulf.

U. S. ENERGY FUELS



Gas-gas liquids gains top all others

BY JOHN C. CASPER

NATURAL GAS and natural-gas liquids accounted for less than 13% of total energy fuels in 1943, but topped 31% for the year 1960.

The chart on this page last week showed how demand for petroleum products increased rapidly until about 1954. But for the 1954-60 period, the rate of gain in demand for these products was only slightly more than the gain rate for all energy fuels.

The left chart above shows that demand for natural gas and natural-gas liquids leveled off in 1955, but this period of slowdown lasted only 2 years. Note on the chart that gas plus gas liquids accounted for 26.3% of energy fuels in 1954, dropped slightly in 1955 and was back up to 26.3 for the year 1956. So, for the 2-year period demand for gas-gas liquids had the same percentage gain as total fuels. The sharp upward trend returned in 1957.

For the 1943-54 period of 11 years, gas-gas liquids portion of total fuels climbed from 12.6% to 26.3%, a shift of 13.7 percentage points in 11 years. After the slowdown in 1955 and 1956, these fuels moved up from 26.3% of the total to 31.5% in a period of 4 years.

Gas-gas liquids fuels have been taking larger and larger portions of the total energy market.

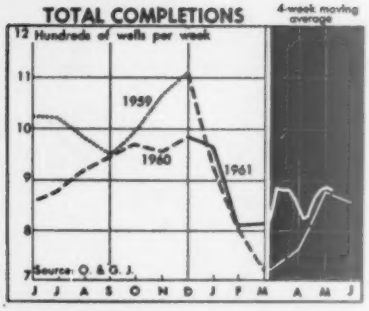
The right chart shows cumulated percentage gains for gas, gas liquids, and total energy fuels since the base period 1943-45. Total energy fuels show a gain of 43.2% since 1943-45. Use of natural gas has increased 238.7%. Gas-liquids consumption is up 230.7%.

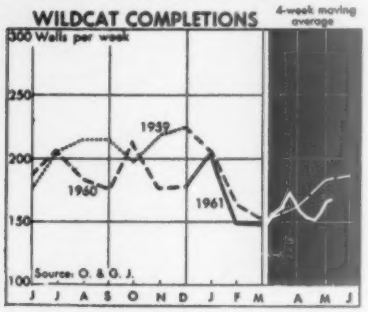
Figures for petroleum products are not a part of the graph, but the relative position will help evaluate the growth of gas and gas liquids. Net use of petroleum products in 1960 represented an increase of 106% over the average for 1943-45 or less than half the percentage growth by natural gas.

The high-gain fuels have displaced coal in some areas. Other gains have been due to a double shift. Oil displaced coal and later gave up part of this market to gas and gas liquids.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,058,685	UP	2,835	UP	150,041
Crude stocks	257,355,000	UP	92,000	DOWN	1,917,000
Completions	789	DOWN	37	. . .	. . .
Refinery runs	8,172,000	DOWN	188,000	UP	336,000
Gasoline stocks	208,825,000	DOWN	1,650,000	UP	890,000
Kerosine stocks	28,594,000	UP	796,000	UP	2,806,000
Distillate stocks	99,712,000	UP	4,477,000	DOWN	1,411,000
Residual stocks	45,147,000	UP	195,000	UP	4,755,000
Four-product stocks	382,280,000	UP	3,818,000	UP	7,040,000
Total imports	1,706,800	DOWN	97,600	UP	52,400





Active Rotary Rigs

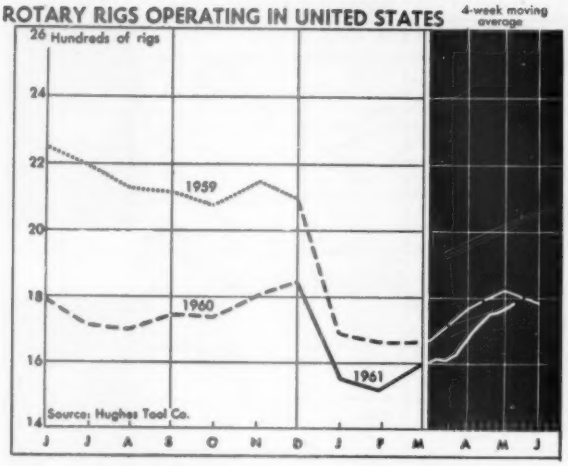
	6-12-61	6-5-61	6-13-60
Alabama	3	5	4
Alaska	10	10	4
Arkansas	11	11	13
Arizona	2	2	1
California	74	70	82
Land	68	64	76
Offshore	6	6	6
Colorado	31	26	22
Florida	0	0	0
Land	0	0	0
Offshore	0	0	0
Georgia	2	2	0
Illinois	39	53	44
Indiana	11	8	11
Iowa	1	1	0
Kansas	100	111	109
Kentucky	5	3	8
Louisiana	293	294	291
North	31	32	44
S. Inland waters	115	114	107
S. Land	88	86	86
Offshore	59	62	54
Michigan	21	29	45
Mississippi	61	63	59
Missouri	2	2	1
Montana	24	23	22
Nebraska	37	41	25
New Mexico	107	117	122
North Dakota	22	19	16
Ohio	6	7	6
Oklahoma	189	209	173
Pennsylvania	7	7	14
South Dakota	1	1	0
Texas	636	632	609
S. Inland waters	6	7	6
S. Land	180	165	176
Offshore	3	3	1
North	59	68	61
Panhandle	49	52	41
East	80	76	67
West Central	156	161	162
West	103	100	105
Utah	23	22	31
Virginia	1	1	0
Washington	1	1	0
West Virginia	6	7	5
Wyoming	49	46	58
Total U. S.	1,775	1,823	1,777
Cum. avg. to date	1,637	1,631	1,737
Western Canada	155	143	156
Eastern Canada	1	1	2
Grand Total	1,931	1,967	1,935

Hughes Tool Co. report.

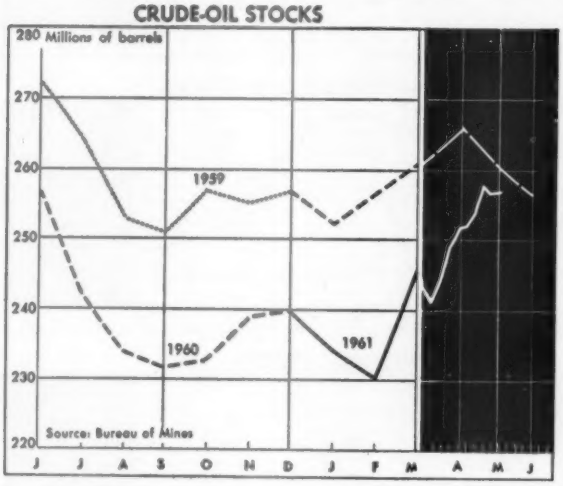
WEEKLY WELL COMPLETIONS . . . WEEK ENDED JUNE 10, 1961

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1961	1960	Total	Crude	Cond.	Gas	Dry	1961	1960
Alabama	0	0	0	0	0	0	0	28	23	0	0	0	0	0	6	1
Alaska	1	1	0	0	0	0	10,852	17	.....	0	0	0	0	0	2	.....
Appalachian	27	1	0	21	1	4	60,603	914	712	0	0	0	0	0	26	18
Arizona	0	0	0	0	0	0	0	11	7	0	0	0	0	0	7	7
Arkansas	4	3	0	0	1	0	12,372	232	271	1	1	0	0	0	45	73
California	32	22	0	4	6	0	190,164	751	595	7	1	0	1	5	125	131
Colorado	6	1	0	0	5	0	27,912	282	280	5	1	0	0	4	135	133
Illinois	73	7	0	0	14	52	134,644	785	863	3	0	0	0	3	151	200
Indiana	11	2	0	0	9	0	9,957	261	411	8	0	0	0	8	80	161
Kansas	77	27	0	9	22	19	190,628	2,364	1,447	14	2	0	2	10	432	480
Kentucky	31	13	0	2	16	0	41,813	641	725	7	2	0	0	5	74	86
Louisiana	48	19	2	7	20	0	298,567	1,585	1,487	7	0	0	0	7	250	219
North	30	14	0	4	12	0	87,805	573	489	5	0	0	0	5	102	94
South	16	3	2	3	8	0	183,359	776	756	2	0	0	0	2	127	109
Offshore	2	2	0	0	0	0	27,403	236	242	0	0	0	0	0	21	16
Michigan	17	2	0	0	15	0	53,058	304	328	8	0	0	0	8	120	101
Mississippi	16	10	0	0	6	0	165,657	248	332	6	1	0	0	5	81	116
Montana	6	1	0	0	4	1	31,632	161	116	4	0	0	0	4	75	54
Nebraska	13	5	0	0	8	0	59,153	416	354	7	1	0	0	6	178	135
New Mexico	36	18	0	11	7	0	167,164	776	811	7	2	0	0	5	138	114
West	14	3	0	10	1	0	74,806	337	262	2	1	0	0	1	47	22
East	22	15	0	1	6	0	92,358	439	549	5	1	0	0	4	91	92
North Dakota	6	2	0	0	4	0	22,328	112	135	2	0	0	0	2	30	30
Ohio	21	8	0	0	4	9	47,171	443	439	0	0	0	0	0	20	24
Oklahoma	62	22	0	2	27	11	222,842	2,524	1,743	11	3	0	1	7	259	341
Texas	288	166	16	13	92	1	1,337,134	6,374	7,131	48	4	0	1	43	1,276	1,424
Dist. 1	13	6	0	0	7	0	33,064	388	483	4	0	0	0	4	149	169
Dist. 2	14	3	4	2	5	0	91,700	306	343	2	0	0	0	2	66	81
Dist. 3	15	5	2	4	4	0	94,652	467	546	1	0	0	0	1	92	100
Dist. 4	28	13	3	2	10	0	152,518	564	498	4	0	0	0	4	117	146
East	44	33	2	0	9	0	219,917	540	551	5	0	0	0	5	116	115
Dist. 7-B	35	19	0	1	15	0	110,408	895	1,036	11	2	0	0	9	238	254
West	78	49	5	3	20	1	445,560	1,591	1,900	15	2	0	1	12	344	297
Dist. 9	46	26	0	0	20	0	134,651	1,063	1,337	5	0	0	0	5	111	193
Dist. 10	15	12	0	1	2	0	54,664	560	437	1	0	0	0	1	43	29
Utah	3	2	0	0	1	0	21,304	112	127	1	0	0	0	1	46	44
Wyoming	10	2	0	0	8	0	54,176	431	430	3	0	0	0	3	162	185
Misc. (Nev.)	1	0	0	0	1	0	600	98	60	1	0	0	0	1	92	47
Total U. S.	789	334	18	69	271	97	3,159,731	19,870	18,827	150	18	0	5	127	3,810	4,124
Previous week	826	358	20	87	334	27	3,166,116	.....	.....	186	9	3	9	165	.....	.....
Cum. 1961	19,870	9,018	437	1,933	7,132	1,350	80,066,182	.....	.....	3,810	301	46	177	3,286	.....	.....
Cum. 1960	18,827	8,907	595	1,500	7,294	531	82,566,446	.....	.....	4,124	378	46	136	3,564	.....	.....
Western Canada	20	10	0	2	8	0	126,411	916	934	0	0	0	0	0	268	272

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	6-3-61	5-27-61	6-4-61
Pennsylvania	2,363	2,375	2,148
Other Appalachian	1,684	1,574	1,801
Illinois, Indiana, Michigan	10,332	10,033	10,142
Nebraska and North Dakota	3,054	3,102	2,845
Kansas	9,659	9,930	9,607
Oklahoma	16,924	17,467	17,739
Arkansas	1,869	2,028	1,957
Louisiana	21,397	21,264	20,440
North	3,405	3,437	3,466
South	17,992	17,827	16,974
Mississippi, Alabama, Florida	2,279	1,851	2,059
New Mexico	7,957	7,992	8,046
Texas	109,248	109,245	108,273
East Texas	9,228	9,268	8,523
West Texas	47,638	48,572	48,965
Texas Gulf	20,116	19,381	19,068
Other Texas	32,266	32,024	31,717
Wyoming	19,495	19,547	17,944
Other Rocky Mountain	9,971	9,287	10,290
California	24,705	25,283	29,292
Foreign	†16,418	16,285	16,689
Total	**257,355**	257,263	259,272

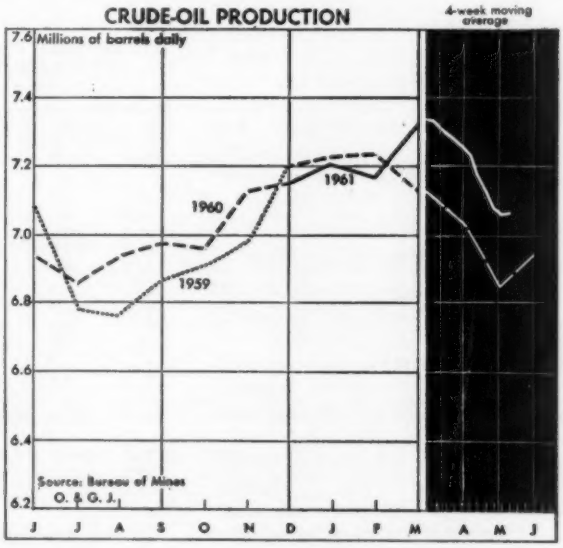
*Bureau of Mines. †Includes 4,528,000 bbl. in California.

DAILY AVERAGE PRODUCTION FOR WEEK

	June 10, 1961			June 3
	Crude oil	Lease condensate	Total	total
Alabama	19,235	.....	19,235	19,200
Alaska	14,300	.....	14,300	14,000
Arkansas	80,825	125	80,950	80,925
California	824,400	.....	824,400	823,500
Colorado	129,000	.....	129,000	128,500
Eastern	39,800	.....	39,800	40,100
Florida	1,050	.....	1,050	1,075
Illinois	212,100	.....	212,100	216,400
Indiana	31,000	.....	31,000	30,300
Kansas	†291,800	.....	†291,800	†311,325
Kentucky	49,200	.....	49,200	49,100
Louisiana	1,025,925	133,750	1,159,675	1,155,400
North	104,925	5,250	110,175	110,175
South	921,000	128,500	1,049,500	1,045,225
Michigan	52,300	.....	52,300	52,100
Mississippi	146,200	3,700	149,900	149,750
Montana	81,700	.....	81,700	81,000
Nebraska	66,900	.....	66,900	66,200
Nevada	450	.....	450	450
New Mexico	308,000	6,800	314,800	316,225
North Dakota	53,800	.....	53,800	52,300
Oklahoma	†495,000	.....	†495,000	†516,100
Texas	2,410,000	89,600	2,499,600	2,460,300
Dist. 1	43,000	2,300	45,300	45,300
Dist. 2	99,000	8,100	107,100	105,675
Dist. 3	309,000	37,000	346,000	388,150
Dist. 4	175,000	12,500	187,500	181,775
Dist. 5	26,000	500	26,500	26,500
Dist. 6	106,000	8,200	114,200	112,775
East Texas field	128,000	.....	128,000	125,150
Dist. 7-B	121,000	250	121,250	120,525
Dist. 7-C	110,000	3,150	113,150	112,075
Dist. 8	997,000	12,000	1,009,000	994,725
Dist. 9	193,000	3,400	196,400	194,250
Dist. 10	103,000	2,200	105,200	103,400
Utah	98,000	.....	98,000	97,600
Wyoming	393,000	.....	393,000	393,300
Others	‡725	.....	‡725	‡700
Total U. S.	6,824,710	233,975	**7,058,685**	7,055,850
Change from previous week, up			**2,835**	
Canada	†552,000	.....	†552,000	†611,100
Total U. S. Prod.—Jan. 1-June 10				1,166,786,700 bbl.
Same period last year (crude plus cond.)				*1,147,759,700 bbl.

*Includes 37,603,700 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Arizona.

CRUDE-OIL PRODUCTION



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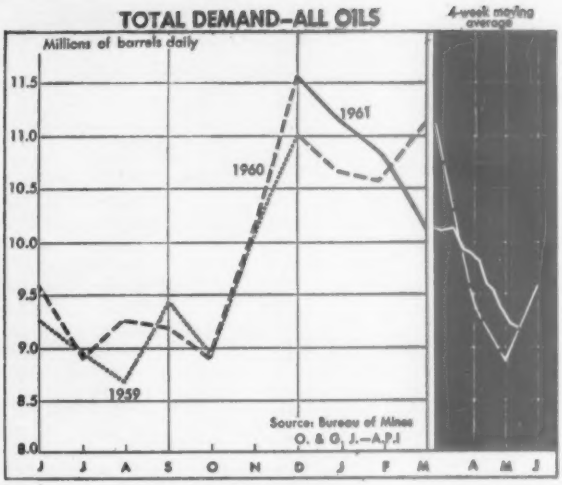

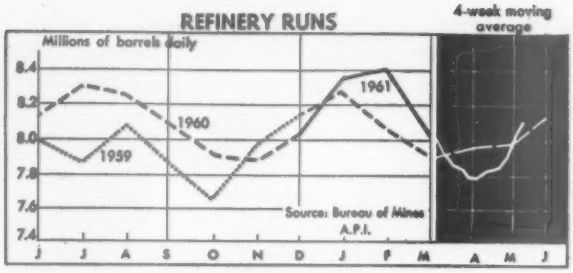

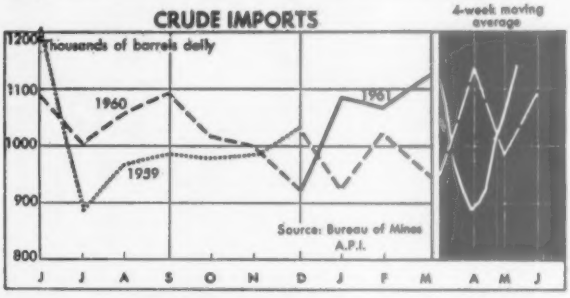

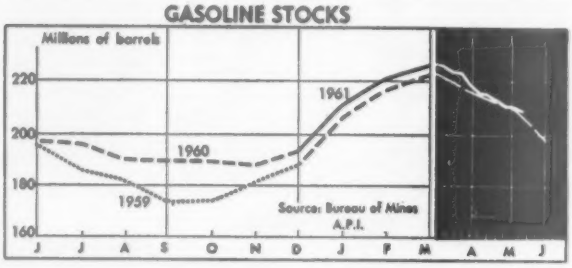

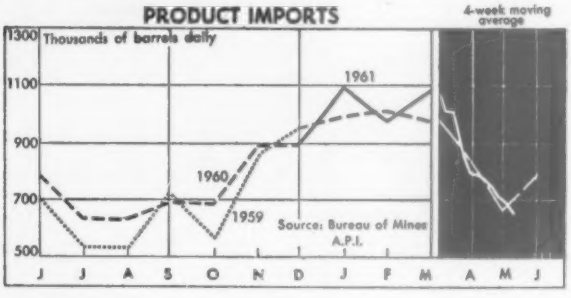

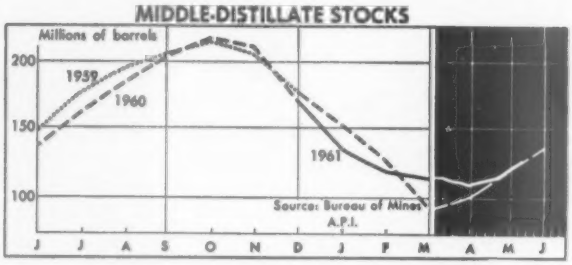

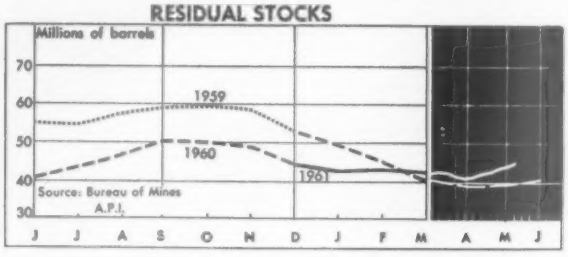

API REFINERY REPORT, JUNE 9, 1961
(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, June 1960 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,110	503.6	38.1	259.9	140.9	49,472	10,876	30,256	11,141	1,128	528.9	34.2	325.7	146.4
Appalachian:														
District 1	102	41.1	2.9	24.4	8.4	6,237	630	2,156	418	96	41.2	2.7	21.7	7.7
District 2	96	50.6	2.3	18.3	9.7	3,098	354	1,142	272	90	46.6	2.1	16.3	8.5
Ind., Ill., Ky.	1,491	766.0	56.1	304.6	148.3	36,701	4,942	17,215	5,366	1,455	774.4	66.7	301.8	128.0
Minn., Wis., Dak.	132	60.6	8.0	32.0	18.6	6,384	725	3,872	645	128	62.3	5.3	32.8	14.6
Okla., Kans., Mo.	742	416.7	18.1	144.3	9.4	18,036	1,398	9,683	946	751	422.7	17.5	175.7	21.0
Inland Texas	314	188.3	12.7	62.0	17.3	7,854	534	1,559	2,644	304	223.5	10.0	49.8	22.4
Texas Gulf Coast	1,918	1,021.6	120.0	484.0	111.9	28,094	3,542	11,737	4,616	1,967	1,007.0	95.5	462.6	141.8
La. Gulf Coast	678	402.6	24.9	161.1	38.9	11,754	2,657	4,493	1,354	653	329.2	45.0	136.5	41.6
N. La. and Ark.	117	67.6	7.4	20.1	7.1	5,964	843	1,760	138	112	64.5	4.9	24.4	5.6
Rocky Mountain:														
New Mexico	26	12.7	0.7	5.4	2.4	745	56	214	27	24	13.2	0.3	4.3	2.2
Other Rocky Mt.	290	142.8	2.8	65.9	35.1	7,637	445	2,558	952	275	132.9	3.7	63.2	27.8
West Coast	1,156	552.4	43.1	194.3	293.9	26,849	1,592	13,067	16,630	1,143	513.7	37.4	163.2	275.7
June 9, 1961	8,172	4,226.6	337.1	1,776.3	841.9	208,825	28,594	99,712	45,149	8,126	4,160.1	325.3	1,778.0	843.3
June 2, 1961	8,360	4,151.4	313.9	1,782.0	932.0	210,475	27,798	95,235	44,954	.....	.....	.....	.....	.....
June 10, 1960	7,836	4,134.1	372.1	1,777.6	821.3	207,935	25,788	101,123	40,394	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	(†)	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague. †Two buyers announced increase.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	$4.80
Middle District	4.52
Southwest Pennsylvania	4.25
West Virginia	4.17
Buckeye Grade	4.08
Illinois Basin	**3.00-3.05**

FOREIGN

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)	
Arabian, 34.0°-34.9°, Ras Tanura	$1.80
Iranian, 34.0°-34.9°, Bandar Mashur	1.78
Iranian, 34.0°-34.9°, Abadan	1.73
Iraq, 35.0°-35.9°, Fao	1.72
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.59
Qatar, 41.0°-41.9°, Umm said	1.95
Middle East, E. Mediterranean:	
Arabian, 34.0°-34.9°, Sidon	$2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli	2.19
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 36°	2.42
Canada:	
Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Weyburn (light)	2.06
Midale C	1.70
Venezuela:	
Cumarebo, 47°-47.9°, Tucupido	3.34
San Joaquin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

TANKER RATES (Long Ton)

(Latest reported spot fixtures)

Gulf-NY, dirty (ATRS—17.5%)	$2.35
★Carib.-NY, dirty (ATRS—50%)	1.38
★Carib.-UK, dirty (Scale—67.5%) (10s. 7d.)	1.48
★PG-Japan, dirty (USMC—77.5%)	2.30
PG-NY, dirty (USMC—75%)	3.18

★Denotes change from previous week.

REFINED PRODUCTS

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (91 octane)	12.25-12.50
Premium (99 octane)	15.00-15.25
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.50-11.00
Regular (92 octane)	10.75-11.25
Premium (98 octane)	11.75-12.25
California (rack) Los Angeles:	
Regular (90 octane)	11.60
Premium (94 octane)	12.60
Premium (100 octane)	14.10
Caribbean area (cargoes):	
Regular (87 octane)	9.125
Premium (97 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-9.75
Diesel oil (58 d.i. and above)	9.00-9.25
Distillate No. 1	9.00-9.25
Distillate No. 2	8.25-8.50
Gulf Coast (cargoes):	
Kerosine 41-43	9.00
Distillate No. 2	8.25
New York Harbor (barges):	
Kerosine 42-43	*11.40
Distillate No. 2	*10.40
Diesel fuel, 48-52 d.i.	*10.55
Caribbean area (cargoes):	
Distillate No. 2	8.625

*Subject to 0.5 cent discount.

RESIDUAL FUEL (Bbl.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.65-1.75
Gulf Coast (cargoes):	
Bunker C fuel	2.20
New York Harbor (barges):	
Bunker C fuel	2.52
Caribbean (cargoes):	
Bunker C fuel	2.00
California (rack):	
Bunker C fuel, Los Angeles	2.25

Classified Advertising

. . . your market place for the oil and gas industry

RATES:

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- DISPLAYED CLASSIFIED: $20 a column inch one issue. 10% discount three or more consecutive issues. Minimum size one inch. Subject to agency commission.
- All classified payable in advance.
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FOR SALE EQUIPMENT

FOR SALE:
Abandoning machine mounted on semi-trailer. Skid Mounted. Can be removed from trailer very easily. Complete with hydraulic jacks and many tools. The Oil Tool Corporation, 3075 Cherry Avenue, Long Beach 7, Calif.

1—U-34 Unit Rig Drawworks w/2 GKU-145 Waukesha Engines.
2—87' LCM Mast & Substructure.
1—96' LCM Mast & Substructure.
Write for Equipment Inventory
D. L. JOHNSTON
952 Captain Shreve Drive
Shreveport, Louisiana

LOCATED HOUSTON, TEXAS
(from Amoco Refinery Co., Destrehan, La.)
HEAT EXCHANGERS
50 to 4,000 sq. ft.
VESSELS—TOWERS
12" to 8' dia.
PETROCHEM FURNACES
½MM, 2½MM, 5MM BTU
PUMPS
50 to 7,000 GPM
—WIRE—PHONE—WRITE—
BRILL EQUIPMENT COMPANY
4101 SAN JACINTO ST., HOUSTON 4, TEXAS
35-65 JABEZ STREET, NEWARK 5, N. J.

FOR SALE

Absorption Type Gasoline Plant, located near Haynesville, Claiborne Parish, Louisiana, consisting of the following major items of equipment, together with auxiliary equipment:

1—10'0" x 42'0" Still Reflux Tank, 126# D.P. @ 450° F.
4—96" x 54'0" Horizontal Iso-Butane Storage Tanks, 112# D.P. @ 450° F.
1—42" x 84'0½" Debutanizer
1—36" x 65'0" Depropanizer
1—48" x 48'0" Still
1—42" x 64'0" Fat Oil Stabilizer
1—42" x 63'9" Absorber
1—54" x 117'6" Deisobutanizer
3—12'0" x 48'0" Gasoline Storage Tanks
2—9'0" x 36'0" Propane Storage Tanks, 220# W.P.
1—30' x 42' x 10' Steel Building
3—75 KW General Electric Generators, Model 8236851, 93.8 KVA, 480 V-N-60
5—Henry Vogt Class ML-4-17 Bent Tube Water Tube Boilers

This equipment to be sold in place, as is, for dismantling and removal at expense of buyer. For appointment to inspect, contact.

Otis P. Addington, General Manager
Haynesville Operators Committee
Telephone 300
Haynesville, Louisiana

FOR SALE EQUIPMENT

CLARK MA-4 Gas Compressor, 150 HP, skid-mounted with radiator and accessories; 2 I.R. XVG6 Gas Compressors; 4225 HP Clark Centrifugal Compressor 9920 CFM 240 PSI discharge Pumps; Exchangers; Vessels. Brill Equipment Company, 4101 San Jacinto St., Houston 4, Texas.

Buying Good Used Equipment
is frequently the difference between having needed equipment or doing without it.

FOR SALE EQUIPMENT

COMPLETE CASING pulling rig, Wilson Super, 7" x 8" x 65' mast, 7" x 5¼" jacks, tools to pull casing, tubing and rods. Box 426, El Dorado, Ark., Phone UN 3-7415.

1 MODEL-D SONOLOG well sounder. Used approximately 10 hours. $2,200.00 F.O.B. Post Office Box 323, Jackson, Miss.

AT N. LITTLE ROCK, ARKANSAS
3—Worthington #LTC-4 compressors, 3500 CFM @ 45 PSI, 24 x 15, 2-cyl., 500 HP, 4-cycle. gas-engine drive.
Phone POplar 3-3505
PERRY EQUIPMENT CORP.
1402 N. Sixth St.
Philadelphia 22, Pa.

LIQUIDATION

ESSO REFINERY—BALTIMORE, MD.—MOST EQUIPMENT NEW 1956

TOWERS

84" x 39' 16 Trays 178 PSI
54" x 30' 12 Trays 200 PSI NEW
48" x 39' 16 Trays 283 PSI
36" & 6' x 97' 34 Trays 280 PSI
30" x 36' 9" 7 Trays 360 PSI

PETRO-CHEM FURNACES

30.7MM/BTU 19.3MM/BTU
10.4MM/BTU 9.7MM/BTU
7.5MM/BTU 2MM/BTU

NEW 5% CHROME FURNACE TUBES

1,200'-6" ½" Wall 420'-6" ⅜" Wall
114'-5" " " 250'-5" " "
1,030'-4" " " 1,300'-4" " "

DRUMS

12' x 45' 171 PSI NEW
10' x 30' 160 PSI Lead Lined
9' 4" x 38' 345 PSI Refractory
8' 6" x 35' 120 PSI Gunite
94" x 20' 319 PSI Refractory
6' x 33' 175 PSI Gunite
6' x 27' 300 PSI 18-8 SS Screens
6' x 13' 114 PSI NEW
64" x 25' 323 PSI Refractory
5' x 20' 240 PSI NEW
4' x 17' 530 PSI
4' x 14' 250 PSI Gunite
3' x 16' 286 PSI
3' x 13' 300 PSI Gunite
3' x 12' 5" 550 PSI

COMPRESSORS

3—Ingersoll-Rand 510 CFM Hydrogen Recycle Type 2HHE Non-Lubricated Compressors, Single Stage, Double Acting, 2 Cylinder, 500 PSI Discharge, 350 HP Totally Enclosed Inert Gas Filled Motor Drive.
2—Worthington Recycle Gas Boosters 7¾" x 9", Motor Drive.

HEAT EXCHANGERS & CONDENSERS

18-8 STAINLESS STEEL			ADMIRALTY			5% CHROME		
SqFt	Tubes	Shell	SqFt	Tubes	Shell	SqFt	Tubes	Shell
2,320	75 PSI	135 PSI	1,640	100 PSI	145 PSI	1,040	1,500 PSI	110 PSI NEW
1,860	625 PSI	145 PSI	1,350	100 PSI	530 PSI	975	530 PSI	200 PSI
1,150	75 PSI	15 PSI	1,135	100 PSI	230 PSI	573	530 PSI	715 PSI
1,000	100 PSI	50 PSI	1,025	75 PSI	100 PSI NEW	STEEL		
890	100 PSI	75 PSI	665	100 PSI	236 PSI	2,240	840 PSI	260 PSI
615	100 PSI	75 PSI	600	100 PSI	325 PSI NEW	1,040	840 PSI	145 PSI
420	100 PSI	100 PSI	548	100 PSI	200 PSI	890	230 PSI	165 PSI
235	75 PSI	75 PSI	216	100 PSI	260 PSI	485	715 PSI	260 PSI
						238	570 PSI	530 PSI

RECYCLE GAS DRYER
consisting of
2—4' 6" x 11' Recycle Drums 600 PIS
1—1' 4" x 4' 3" Hydrier 230 PSI

CENTRIFUGAL BLOWER
7,500 CFM, 42.5 PSIG with 1,250 HP Synchronous motor

PUMPS
Ingersoll-Rand 400 GPM @ 615'
Pacific 349 GPM @ 2,040' 7 Stage
Pacific 173 GPM @ 738'
Byron Jackson 107 GPM @ 1,460' 12 Stage 410 SS Impeller
Byron Jackson 88 GPM @ 1,750' 8 Stage

Heat & Power Co., Inc.
NEW YORK OFFICE—60 E. 42, N. Y. 17 • MU 7-5280
TULSA OFFICE, 310 Thompson Bldg. Tulsa 3, Okla., LUther 3-4890
SITE OFFICE—Boston & Haven Sts. Baltimore 24, Md., ORleans 5-0595

FOR SALE EQUIPMENT

WILL SACRIFICE! All offers considered 800 HP Worthington, LT6 Compressor. Box M-381, The Oil and Gas Journal, Tulsa, Oklahoma.

USED QUICK-CYCLE hydrocarbon Recovery and Gas Dehydration Units: 12MM to 30 MM SCFD capacities at 1000# W.P.—turnkey installation. Other used gas processing equipment available including gas dehyrators, glycol type. Two Used 10' x 22½' x 50# W.P. Emulsion Treaters with New 1.0 MM BTU/Hr. Firetubes and New Valves and Accessories. Engineered Specialties Co., Box 35683, Phone FL 1-5284, Dallas 35, Texas.

One Vertical Direct Fired Water Heater

Radiant with separate convection section, 2.04 MM BTU/HR Heat Absorption Rating, 14,600 LBS/HR Charge Rate, 140° F. temperature differential, 95 PSIG Inlet Pressure, Series 300 ASA Flanges, Natural Gas Burner, ASTM-106B Sched. 40 Carbon Steel Tubes, 6'-0" OD x 10'-6" high to Bottom Stack.

One Vertical Convection Crude Oil Heater

Radiant Integral Two-Pass 5.35 MM BTU/HR Heat Absorption Rating, 135,310/11.181 LBS/HR Charge Rate of 21° API/18 M.W. Crude, 150/220° F. Inlet/Outlet Temperature, 102 PSIG Inlet Pressure, Ohio 1000 Series 850 Cleanout Headers, Natural Gas Burners, ASTM A-161 Carbon Steel Tubes, 7'-3" OD x 23'-0" high to Base of Stack.

NEW—Specially priced for immediate sale.

Address requests for prices or additional information to:

Box M-435, The Oil and Gas Journal
Tulsa, Oklahoma

LIQUIDATION

at WHITING, IND.

Modern 15,000 BSD Fixed Bed HYDROFORMER

Must Remove At Once Will Be Sold As Units Or Piecemeal

3—Steam Driven GAS COMPRESSORS
2495 CFM 205 PSI Discharge
3—Steam Driven
RECYCLE GAS COMPRESSORS
11840 CFM 325 PSI Discharge
1—Electric Driven AIR COMPRESSOR
2760 CFM 325 PSI Discharge 800 HP

DRUMS
8' x 30' 222 PSI Design
6' x 15' 342 PSI Design
6' x 22' 1260 PSI Design

TOWERS
8' x 63'—18 tray 390 PSI
7' x 83'—30 tray 342 PSI
4' x 83'—34 tray 222 PSI

PUMPS—EXCHANGERS
VESSELS

Write for Inventory
Send Us Your Requirements

HEAT & POWER CO., INC.
60 East 42nd St., New York 17, N. Y.
310 Thompson Bldg., Tulsa, Okla.

FOR SALE EQUIPMENT

AN INVESTMENT! Productive advertising is an investment rather than an expenditure. Experienced oil men have found that The Oil and Gas Journal is their best classified advertising medium.

COMPLETION AND Workover Walker-Neer C-37 Triple-drum spudder, twin-axel mounted, with tools. Charles H. Updegraff, Receiver, Box 65, Coudersport, Penn.

1—TYPE 10 BESSEMER Twin with late type 17" power cylinders, Two stage compressor. 1—Type 10 Bessemer single with late type 17" Power Cylinders, Two stage tandem. Wescott-Greis meters, back pressure regulators and meter setting. All in excellent condition. Thomas Drilling Co., Inc., First National Bank Building, Holdenville, Oklahoma.

Sales—GAS COMPRESSORS—Rentals

Save 25% to 40% over new price
Used 30 h.p. to 300 h.p.—Guaranteed
New and Rebuilt Gas Engines

INDEPENDENT FIELD SERVICE, INC.
505 Montgomery St., Shreveport, La.
Phone 425-3497

EQUIPMENT WANTED

WANTED—118 Royal "B" Scintillator. Must be in good condition. Give price in first letter. Clayton Co., 211 Riverwood Drive, Bowling Green, Kentucky.

WANTED . . .

8" Used or New Surplus Steel Pipe Couplings; 8-Thread, with or without dutchmen. Any quantity; any area. Immediate inspection and quick pick-up with our own trucks.

Write—Wire or Phone "COLLECT."

DAVID CRANCER
PRospect 3-3020

VALLEY STEEL PRODUCTS CO.
124 Sidney St. St. Louis 4, Mo.

HELP WANTED

OIL JOB DIRECTORY, foreign and domestic, showing where to apply for jobs $5.00 cash OIML Co., Box 2603, Tulsa, Oklahoma.

CHEMICAL PROCESS ENGINEERS

Experienced in the design or operation of Ammonia, Petroleum Refining or Petro-Chemical Plants.

Send complete resume in confidence to:

Mr. Willwater
Employment Supervisor

FLUOR CORP.

2500 So. Atlantic Blvd.
Los Angeles 22, Calif.

HELP WANTED

POSITIONS OPEN for superintendent, chief operator, chief repairman, and chief clerk for new natural gasoline plant under construction at Lignite, North Dakota. Reply to The TXL Oil Corporation, 3100 Fidelity Union Tower, Dallas 1, Texas.

NATURAL GAS Engineer with engineering degree plus 3 to 5 years experince in plant design or operation for work in the Gulf Coast Area. Amerada Petroleum Corp., Gas Department, P. O. Box 2040, Tulsa, Oklahoma.

GEOLOGIST—For Houston Independent. Must have good experience South Louisiana and Texas Gulf Coast and willing hard work both field and office. Salary $10,000 plus benefits. Send resume and photo to Box M-444, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER for sales work. Houston Manufacturer of gas lift and oilfield production equipment. Give resume of experience. Our employees know of this ad. Box M-418, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED:
DEVELOPMENT AND PROJECT CHEMIST

Established West Texas servicing company needs an experienced "take charge" chemist who can roll up his sleeves and go to work initiating, developing and completing his own projects as well as those assigned by management. Previous well-servicing research required. Salary open. Forward comprehensive personal resume to:

Box M-428, The Oil and Gas Journal
Tulsa, Oklahoma

CHIEF PROCESS ENGINEER

Clark Oil & Refining Corp., has opening for Chief Process Engineer. Must have B.S. or M.S. in Chemical Engineering and varied experience in process calculations. General knowledge and understanding of Cat Cracking, Alkylation, Platforming, and utilities desirable. Send complete resume, including salary requirements to:

CLARK OIL & REFINING CORP.
P. O. Box 297
Blue Island, Illinois

SALES APPLICATION ENGINEER for NATURAL GAS INDUSTRIES

Here's an attractive opening for a natural gas application engineer with experience in gas transmission, gas distribution, or oil and gas production.

Responsibilities will include application engineering of pneumatic and electronic control systems for the gas transmission and gas distribution industries, coordination of sales effort including some customer contact and travel, and sales promotion.

The Foxboro Company, a leading manufacturer of instrumentation and control systems, is located in a suburban community within easy driving distance of metropolitan Boston and Providence. Its operation is international, progressive, steadily expanding, and almost entirely civilian.

If an opportunity like this appeals to you, and if you believe you are qualified, please mail an outline of your education and experience to

E. N. Hayes, Jr.
Manager, Oil & Gas Division
THE FOXBORO COMPANY
FOXBORO, MASSACHUSETTS

HELP WANTED

WANTED PETROLEUM Engineer or first class field man who knows production and normal field operations. This job is far above average and compensation far above expectation. Furnish complete resume. Box M-443, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED ELECTRICAL-Instrument Engineer for large midwest refinery. Must be qualified to develop and engineer electronic control systems. Send complete resume including salary requirements to: Box M-442, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER

Independent Refiner located in Northwest Louisiana has immediate opening for a graduate Chemical Engineer with several years experience in petroleum refining. Applicant should have varied background in both practical and technical aspects of petroleum refining. A practical approach to problems is essential for this position. Submit complete resume of experience, education and salary requirements. Reply to:

Box M-429

The Oil and Gas Journal
Tulsa, Oklahoma

SITUATIONS WANTED

CHEMICAL ENGINEER: 32, 6 years diversified experience (Drilling, workovers, budgets, forecasts, production, reservoir, evaluations) with major in South America. Will relocate anywhere in U. S. Resume on request. Box M-422, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTING SUPERVISOR
Twenty years responsible and diversified experience with independent. Willing to relocate in Montana, Wyoming, Colorado or South Dakota with oil company offering opportunities for advancement. For personal resume write: Box M-434, The Oil and Gas Journal, Tulsa, Oklahoma.

ELECTRICAL ENGINEER: 35, ten years pipeline station electrical and control design, construction, and startup, foreign and domestic. Box M-397, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, B.S. in Geophysical Engineeering, 5 years seismic and subsurface experience. Desires responsible position. Box M-433, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST 31, M.S. 1960. Ten years diversified electronic experience while working my way through college. Interested in becoming associated with the oil industry. Free to travel or move anywhere. Complete resume sent upon request. P. O. Box 861, Richardson, Texas.

GEOPHYSICIST
Wide experience seismic interpretation and program supervision. Domestic assignment preferred. Box M-437, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGICAL Engineer, 10 years diversified experience in production, drilling, exploration, and landwork. Desires responsible position. Will relocate. Box M-438, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE MECHANICAL Engineer, 14 years diversified refining experience in inspection, design, maintenance, operations, planning, administration and management. Desire career opportunity with small to medium-sized growth company. Fluent, adept, skillful at dealing with people at all levels. Have resigned responsible management position with major U. S. concern overseas. Am returning to U. S. permanently in early August to benefit children's education. All locations considered. Age 33. Resume on request. Box M-446, The Oil and Gas Journal, Tulsa, Oklahoma.

MANAGE YOUR PRODUCTION, evaluations, and drilling activities anywhere in US from my office in Wichita, Kansas. Will offer complete accounting, legal, geological, banking, labor, and supervisory facilities for your needs. Thirty-four year licensed professional petroleum engineer with consulting and major experience from Gulf through Nebraska. Would consider personal employment contract if headquartered in Wichita. Box M-448, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

REGISTERED PETROLEUM Engineer, Saskatchewan and Illinois, B.S. degree University of Pgh., age 41, married, two children. Eighteen years diversified experience in production, reservoir and evaluation engineering, drilling and completion. Last five years served as chief engineer for major oil company in Saskatchewan. Have had experience in Illinois basin and Michigan. Desires position with independent or financial group. Will relocate anywhere in USA, Canada, or Alaska. Above average academic and professional background. Complete resume upon request. Box M-445, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER 35, eleven years experience including drilling off-shore Gulf Coast, production, workover, marine pipeline, dehydration and waterflood project planning, design and equipment ordering for Lake Maracaibo operations and telemetering, telecontrol system studies for production operations. Now in U. S., desire employment with producing company. Box 31 A 430, 4041 Marlton Ave., Los Angeles 8, California.

PRODUCTION FOREMAN: 35 married, 7 years experience, completions, work-overs, water flooding. Will relocate. Degree. Box M-440, The Oil and Gas Journal, Tulsa, Oklahoma.

SERVICES

COMPLETE LEASE and title service. J. A. Buchanan, P. O. Box 1344, 313 Peoples National Bank Bldg., Tyler, Texas.

HAVE YOU PLUGGED A PRODUCER?
Micro-Fluorolog prepared from your well cuttings will determine oil bearing stratas drilled through, and will indicate oil stratas at greater depth not yet drilled. Effective on old well samples or while being drilled. Logs: $100 per 1000 ft. Information:
PetroCo, Box 882, Casper, Wyoming

BUSINESS SERVICE

DELAWARE CORPORATION formed and serviced American Guaranty & Trust Company. P. O. Box 487, Wilmington, Delaware.

KARL A. RIGGS, Ph. D.
Consultant
National *International*
Exploration & Production Investigations
Appraisals, Management & Reports
723 Penguin Drive Dallas, Texas

MONEY RAISING

WANTED—CAPITAL to help develop a 25 million dollar placer gold mine. Qualified Engineer's report available to interested parties. C. L. Craig, Box 790, Plainview, Tex.

BUSINESS OPPORTUNITIES

FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition direct or thru your attorney to Consultant 817—51st Street, Brooklyn, N. Y.

NEED RETIRED Geologist to do geology work on an interest basis. For further information write: Manuel Rudy, 3818 Canal Street, Houston, Texas.

DISTRIBUTORS WANTED—For Masterseal line of lost circulation products, Masterseal, Masterbridge, Masterplug, and Masterfiber. Good areas still open. Masterseal Sales Corporation, Box 1501, Ventura, California.

LEASE AND DRILLING BLOCKS

HAVE 100,000 ACRES of Ohio and West Virginia Oil and Gas Leases in Appalachin Basin Area for immediate sale in the Multa Million acre lease play scattered in and through major companies holdings, specializing in 50 to 60 thousand acre blocks. David Law, 716 Union Trust Building, Parkersburg, West Virginia.

PRODUCTION, 100 acres, 2 Tar Springs Wells, Butler County, Kentucky. Take 190D Mercedes and cash or H. J. or K35 Beech. 395 acre block. 80 acres held by production, 10-9S-7E. 4 miles South Eldorado, Illinois. Good prospect from Palestine thru McCloskey. Take cash or interest in well. George M. Robertson, Harrisburg, Illinois.

LEASE AND DRILLING BLOCKS

TEN YEAR LEASES—5,000—15,000 acre Blocks—good play areas. Ohio-West Virginia Production. Box 393, Marietta, Ohio. Phone 373-6862.

NEBRASKA ACREAGE available. Selected blocks in major company areas on Chadron Arch play. P. O. Box 1527, Durango, Colorado.

WYOMING, SWEETWATER COUNTY—new 640 acre Federal Lease 13N-103W Sections 2 & 3—active area—send offers to Stanley Zysk, 20 Vesey Street, New York City.

PROSPECTIVE OIL LEASES: Am fee landowner over 2,000 acres near Pan American Petroleum Corporation No. 1 List, Sec. 23, Block 68, Township 1, T&P Survey, stratigraphic test, projected to 8,500 feet, anticlinal axis nearby, Hudspeth County, Texas, leases available Hudspeth, Crane, Terrell Counties, Texas. Write landowner: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

WILDCAT LEASES, Illinois, 700 acres, 2 years. Can drill for $20,000 cash. Good geologist reports—drill 3,000 feet, St. Peter's sand. Interest in well free. Checkerboard leases. Contact Myrtle Leak, 511 North Hayel, Danville, Illinois. Phone HI 6-4054.

DO YOU HAVE A LEASE TO SELL? For as little as $5 per week you can tell your proposition to over 45,000 oil men through The Journal's classified advertising pages. You'll be surprised how many are interested.

APPALACHIAN NATURAL GAS PROSPECT
9,000 acre lease block immediately off-set by major company holdings. Commercial five to twenty year leases. Yearly rental of $.50 per acre paid quarterly in advance. Active leasing area. Thorough geological report prepared by eminent Appalachian geologist available on request. Principals only. Kindly reply on individual or Company letterhead. **Box M-447, The Oil and Gas Journal, Tulsa, Oklahoma.**

Will sell a few "several thousand acre checkerboards" of leases in various areas in Pennsylvania and Ohio where seller will promptly test Oriskany, Helderberg, Medina and deeper formations—no pre-ration—ready market @ 27 cents per M.C.F. Seller willing to participate in drilling deals with responsible buyers. Excellent success record of seller includes recent significant Oriskany gas pool discovery in Ashtabula County, Ohio and "Shearer Oil Pool" discovery in Coshocton County, Ohio in 1952. Write to:
James L. Shearer, President, James Drilling Corporation
250 Newport Road, Blairsville, Pennsylvania

LEGAL

SALE OF OIL AND GAS MINING LEASES, TRIBAL INDIAN LANDS. Department of the Interior, Bureau of Indian Affairs, Uintah and Ouray Agency, Fort Duchesne, Utah.

SEALED BIDS will be received until 2:00 P.M. Mountain Standard Time, July 6, 1961, and opened at that time in the office of the Uintah and Ouray Agency, Fort Duchesne, for leasing of 30,450.88 acres of Tribal Indian lands, located in Townships 4 and 5 South, Ranges 8, 9 and 10 West, Uinta meridian, Duchesne and Wasatch Counties, Utah, for oil and gas mining purposes. Details of the lease opening and how and where to file bids may be obtained by addressing an inquiry to the Superintendent, Uintah and Ouray Indian Agency, Fort Duchesne, Utah.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Billings, Montana. Notice is hereby given that 3,355.54 acres of land within four known geological structures in the State of Montana and one known geological structure in the State of North Dakota are offered for oil and gas leasing by competitive bidding. The structure, county in which located and area of land offered are as follows: CEDAR CREEK FIELD, Fallon County, 1959.55 acres, Prairie County, 120 acres, Wibaux County, 35.99 acres; DRY CREEK FIELD, Carbon County, 680 acres; GAS RIDGE FIELD, Toole County, 240 acres; KEVIN-SUNBURST FIELD, 240 acres, all located in Montana. CROFF FIELD, McKenzie County, North Dakota, 80 acres. The above lands will be offered to the qualified bidder of the highest cash amount per acre at 10 a.m., M.S.T., July 18, 1961, when bids will be opened. Description of the lands offered, details of the lease offering, how and where to submit bids, may be obtained from the Land Office, Bureau of Land Management, 1245 North 29th Street, Billings, Montana. Thomas H. Floyd, Jr., Manager, Land Office.

(Continued from Page 178)

field and laboratory study of limestone and dolomites. Pan American's seminar group, which will include the company's operations and research geologists, have spent a week in the Bahama Islands and the Florida Keys studying present-day carbonate depositional environments and the sediments that characterize them. Members of the seminar will then fly to the Guadalupe Mountains of West Texas and New Mexico.

Third week will be spent in studying laboratory methods, techniques and case histories of oil-producing carbonate reservoirs.

Geologist gets grant

A University of Texas geologist has received a $2,800 National Science Foundation grant to survey the Central Texas region which separates two of the state's most productive oil and gas and mineral areas.

Dr. William R. Muehlberger will make studies of magnetic and gravitational fields along the Ouachita fold belt to determine major geologic structures and types of rocks. The area to be studied is bounded by Taylor, Lampasas, Marble Falls, and Austin.

The region is flanked on the north by the Fort Worth basin, rich in oil and gas deposits, and on the south by the mineral-laden Llano uplift.

"These studies will determine the nature of the boundary between those regions and furnish details as to their origin," Dr. Muehlberger said.

The Ouachita Mountains appear above ground in southeast Oklahoma and near Marathon in Texas' Big Bend country. Buried between the two points for 900 miles is the subsurface Ouachita Fold Belt, stretching along a line through Austin and San Antonio and west of Del Rio.

Dr. Muehlberger, associate professor of geology, is instructor for a closed-circuit videotape television series in use since last fall in beginning geology classes. He has been on the university faculty since 1954 and has served as a geologist with the New Mexico Bureau of Mines and Mineral Resources and the USGS.

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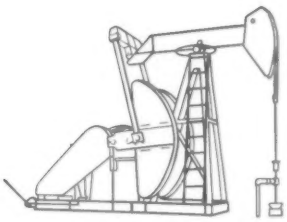

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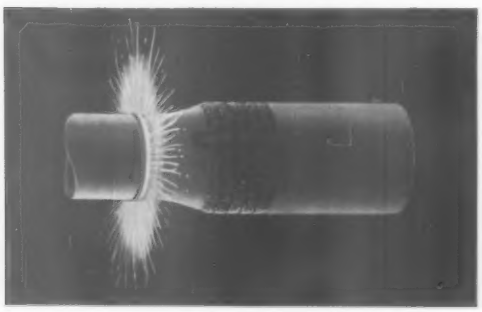

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